[STANDARD.]

THE

AMERICAN

ENCYCLOPÆDIA OF COMMERCE,

MANUFACTURES, COMMERCIAL LAW, AND FINANCE:

Econs. C Cola

COMPRISING

DESCRIPTIVE AND STATISTICAL ACCOUNTS OF COMMODITIES, WITH CUSTOM-HOUSE AND INTERNAL REVENUE REGULATIONS, DUTIES, &c.

MANUFACTURING PROCESSES IN THEIR PRESENT STATE OF ADVANCEMENT.

COMMERCIAL STATISTICS OF THE DIFFERENT COUNTRIES OF THE WORLD, INCLUDING THEIR PHYSICAL CHARACTER, PRODUCTIONS, TRADE, COMMERCE WITH THE UNITED STATES, SEAPORTS, MONEYS, MEASURES, FINANCES, &c.

PATENT LAWS AND REGULATIONS, RAILROADS AND RAILROAD COMPANIES, INSURANCE AND INSURANCE COMPANIES, SHIPPING, WAREHOUSING, &c.

SUMMARY OF THE PRINCIPLES OF COMMERCE, FINANCE, AND BANKING, WITH STATISTICAL ILLUSTRATIONS.

DIGEST OF COMMERCIAL LAW, INCLUDING INSURANCE, PARTNERSHIP, PRINCIPAL AND AGENT, BILLS OF EXCHANGE, SALE, GUARANTY, INSOLVENCY, SHIPPING, AND CONTRACTS AND OBLIGATIONS IN GENERAL.

COMMERCIAL ARITHMETIC AND ACCOUNTS, EXCHANGES, COINS, WEIGHTS AND MEASURES, INTEREST, ANNUITIES, &c. WITH NUMEROUS TABLES.

NATIONAL DEBT, NATIONAL BANKS, &c.

DEFINITION OF TECHNICAL TERMS USED IN COMMERCE AND IN THE MANUFACTURING ARTS; TOOLS, INSTRUMENTS, MACHINES, &c.; BESIDES A VARIETY OF MISCELLANEOUS INFORMATION.

By L. DE COLANGE, LL.D.,

EDITOR OF "THE NATIONAL ENCYCLOPÆDIA," ETC., ETC.

ILLUSTRATED EDITION.

VOLUME I.

BOSTON:
PUBLISHED BY ESTES AND LAURIAT.
1881.

UNIVERSITY PRESS
JOHN WILSON & SON
1639
CAMBRIDGE, MASS.

TO

VISCOUNT FERDINAND DE LESSEPS,

THE ILLUSTRIOUS ENGINEER,

This Work is Dedicated

BY HIS ADMIRER AND OBLIGED SERVANT,

THE EDITOR.

PREFACE.

THE present is essentially a practical, commercial, and industrial age: newspapers, lecturers, popular authors, all lend their efforts towards the diffusion of sound and useful knowledge among the masses; and the commercial and industrial element has become the leading feature of instruction. The reason of this is obvious, if we but glance at the amazing strides of American commerce, the wide range of products and manufactures in which we are interested, the constant and rapid intercommunication carried on with foreign countries, and the unparalleled progress of our national industry. The trade and commerce of all nations are now daily brought prominently before us through the press; new products are continually introduced, new trades are established, and the raw materials of commerce now imported are so numerous, and so widely different from what they were a quarter of a century ago, that it is difficult for those who are not specially engaged in a particular trade to keep pace with the general information necessary to be acquired.

We have scientific dictionaries in abundance, purely technological, or devoted to one or other of the arts and sciences. We have popular and useful encyclopædias, — works chiefly devoted to the history of nations, cities, and great men, the natural history, the geography of countries, etc., — but we have hitherto had no popular and practical encyclopædia of commerce in all its branches, which might be consulted by merchants, traders, manufacturers, bankers, ship-owners, etc., in conducting the details of their respective business; and also by young men, to acquire that general knowledge of commerce which ought so powerfully to contribute in securing for them a successful career in their particular lines of trade. It has been our ambition to fill that blank, and to produce a work that should be generally useful, particularly to merchants and traders, and which should be creditable to ourselves. Neither labor nor expense has been spared to entitle this encyclopædia to the public confidence and patronage. The editor has been almost incessantly engaged upon it for several years, and, owing to the nature of his previous works, it may be said that few persons have possessed such peculiar facilities for the undertaking.

The best sources of information have been consulted in preparing the different articles, and a free use has frequently been made of them; the editor, in presence

of an undertaking of such magnitude, caring less for complete originality than for accuracy. He has also derived valuable assistance from some distinguished official gentlemen, and from many eminent merchants; and has endeavored, whenever it was practicable, to base his conclusions upon official documents. In very many instances, however, he has been obliged to adopt less authentic data; and he does not suppose that, amidst conflicting and contradictory statements, he has had sagacity enough to uniformly select those most worthy of being relied upon, or that the inferences he has drawn are always such as the real circumstances of the case would warrant. At all events, he has done his best not to be too much wanting in these respects.

It must be well understood that this work is framed with the view, not of instructing the business man in relation to his own immediate and daily pursuits only, but also of placing within his reach information which it is always important, and often necessary, that he should possess, which many engaged in active business might find it exceedingly difficult to procure elsewhere, and which, being presented under an alphabetical arrangement, may be advantageously consulted even by those who have access to more expensive books.

In regard to the matter of the work, as distinct from its form, the editor's aim has been to give the greatest possible amount of facts in the smallest number of words. The plan excludes, in general, long essays and treatises; for even those subjects which require considerable space for their proper treatment have, in most cases, been subdivided and discussed under separate heads in a manner which, it is hoped, will be found better adapted for reference than if they had been wholly contained under one title. Thus, while shipping is the subject of one general article, separate heads are devoted to affreightment, master, seamen, tonnage, demurrage, bill of lading, blockade, embargo, salvage, stranding, barratry, and other matters relating to that department. It has, in short, been the leading object throughout, to adapt the work to the wants of mercantile men, — a class to whom ease and rapidity of consultation, if united with accuracy, are matters of pre-eminent importance.

Commodities are described under their English names; those which they bear in the other principal languages of Europe being also given when thought useful. The account embraces generally, not only a description of the commodity and its uses, but a notice of its growth or manufacture; of the marks by which its quality and genuineness are ascertained; and, in the case of the most important articles, the progress and present state of the trade, and a description of the machinery used in the latest processes of manufacture. The fiscal laws principally affecting each commodity will be found either under its name, or under other heads to which reference is given, according to circumstances. The rate of customs duties is given at the end of each article.

The commercial statistics of the different countries of the world form another leading feature. After a brief description of the position, extent, population, and form of government of each country, there is furnished, in smaller type, according to the latest authorities, a succinct account of its physical character; productions and manufactures; its inland trade; its commerce with other countries, especially the U. States; its finances, banks, railroads, etc.; and a table containing an account

of its measures, weights, and moneys. The article is closed with a descriptive list of its principal seaports.

American commercial law occupies a large portion of the work; the articles being given with a fulness which, it is hoped, may, for all common purposes, make a reference to other books unnecessary.

The remainder of the work cannot be classified. It includes articles on commerce, money, banking, taxation, credit, book-keeping, exchange, interest and annuities, railroads, insurance, customs and internal revenue, regulations, patents, weights and measures, emigration, and a considerable body of miscellaneous information; besides a definition of upwards of 10,000 technical terms used in the arts and on board ship, the greater portion of which could not be found in any other book of reference.

We do not flatter ourselves with the notion that the reader will consider that all that has been attempted has been executed in every case with entire success. In a work embracing such an extreme range and diversity of subjects, respecting many of which it is exceedingly difficult, if not quite impossible, to obtain accurate information, no one will be offended should he detect a few errors. The editor, while soliciting indulgence on this ground, can at least say that no exertions have been spared to procure sound information, to convey it in clear and concise language, and generally to produce a work at once accurate and useful. He will be glad to be favored with any suggestions or corrections for adoption in future editions.

L. De COLANGE.

New York, February, 1881.

COLANGE'S

ENCYCLOPÆDIA OF COMMERCE.

A

A1, an affix to a vessel's name at Lloyd's, the letter denoting the first-class character of the hull for build and sea-worthiness; the figure 1 that she is well-found in rigging, gear, etc.; the figure 2 would imply that she was insufficiently found.

A No. 1, expresses the highest mark of mercantile credit.

Abaca. See MANILLA HEMP.

Abandonment, in *Marine Ins.*, takes place in those circumstances when the insured may claim as for a total loss. The insured may abandon when, by any of the events insured against, the voyage is lost, or is not worth pursuing, when the subject is so damaged as to be of no value to the owner, when the salvage is very high, when the part saved is of less value than the freight, or when further expense is necessary and the insured will not undertake to defray it. When *A.* is accepted by the underwriters, or a total loss paid for, a subsequent recovery will not give a right to revoke the transaction. The insured is in no case bound to abandon. In America and England, the time for giving notice of *A.* depends on circumstances; in France, Spain, and other countries, it is limited by law. When the insured receives intimation of a total loss, he must communicate his election to the underwriter without delay. He is entitled to a reasonable time for ascertaining the state of the case, but must not treat it in the first instance as a partial loss, and abandon on finding his choice disadvantageous. The underwriter, if he object to the *A.*, must give timely notice. See LOSS.

Abas, a Persian weight for pearls, equal to 2⅛ gr. troy, or ⅞ of a carat.

Abatement, a rebate or discount allowed for prompt payment, damage, overcharge, or other reasons.

Abattoir. See SLAUGHTER-HOUSE.

Abbreviation, the contraction of a word or phrase, made either by omitting some of the letters or by substituting certain characters in their place. Those most frequently used in commerce and for general purposes are subjoined:

A or a, approved, accepted.
@, *at*, as 10 lbs. @ \$1.50; *to*, as 20 gallons brandy, \$3.10 @ \$3.15 (it is to say from \$3.10 to \$3.15).
℀, account.
ac., acres.
A.D., the year of our Lord.
A.M., forenoon.
amt., amount.
Ar., Arabian.
bal., balance.
bar., barrel.
bbls., barrels.
bdls., bundles.
bgs., bags.
bkts., baskets.
bls., bales.
bot., bought.
b. o., buyer's option.
bque., barque.
br., brig.
bu., bushel.
bxs., boxes.
c. or cts., cents.
c. or cen., centimes.
cap., capital.
char., charterer.
cks., casks.
℅, care of.
Co., company.
C. O. D., collect on delivery.
com., commerce, commercial.
Cr., creditor.
cs., cases.
cwt., hundred-weight.
d., pence.
D., d., or dol., dollar.
d. d., days after date.
do. or ditto, the same.
doz., dozen.
Dr., debtor.
d. s., days after sight.
dwt., pennyweight.
E., east.
E. E., errors excepted.
E. G., for the sake of example.
E. and O. E., errors and omissions excepted.
ex., per, by or from.
exch., exchange.
Exp., export, exporter.
F., Fahrenheit.
fin., financial.
Fo., folio.
f. o. b., free on board.
Fr., French.
fr., francs.
ft., foot or feet.
gal., gallon.
G. B., Great Britain.
Ger., German.
gr., grain.
gr. or grs., gross.
hf. chts., half chests.
hhd., hogshead.
i. e., that is to say.
Imp., import, importer.
in., inches.
inst., the present month.
inv., invoice.
I. O. U., I owe you.
It., Italian.
£. or L., pound (sterling).
lat., latitude.
lb., lbs, pound, pounds (weight).
Led., ledger.
lon., longitude.
L. S., the place of the seal.
m., miles.
manuf., manufacture, manufacturer.
m. d., months after date.
MS., manuscript.
N., north.
N.B., observe.
No., number.
N. P., Notary Public.
N. S., new style.
%, per cent.
org., organize.
O. S., old style.
oz., ounce.
⅌, per.
pd., paid.
pk., peck.
pkgs., packages.
plts., plates.
p. o. d., pay on delivery.
P. O. O., Post-Office Order.
Por., Portuguese.
prox., next month.
P. S., postscript.
ps., pieces.
pt., pint.
pun., puncheon.
qr., quarter.
qt., quart.
q. v., which see.
R. R., railroad.
Rec'd, received.
Rec't, receipt.
S., south.
s., shilling.
\$, dollars.
Sa. Rs., Sicca rupees.
schr., schooner.
sh., ship.
s. o., seller's option.
Sp., Spanish.
sp. gr., specific gravity.
sq. m., square miles.
s. s., steamships.
str., steamer.
trcs., tierces.
ult., the last month.
U. S., United States.
ves., vessel.
W. I., West Indies.
W. S., writer to the signet.
wt., weight.
yd., yard.
Xmas., Christmas.

Abbs, a term in the wool-trade for the yarn of a weaver's warp.

Abgangs-rechnung, in German commerce the amount of tare allowed on goods.

Abkar, a maker or retailer of spirituous drinks in India.

Aboard, a nautical term signifying in the ship; on the deck of the ship: — hence, in a railroad car, etc.

Abordage, the French term for a collision between ships at sea.

Abraum, a red ochre used to darken new mahogany. It is obtained chiefly from Germany.

Abreast, a nautical term for alongside of, or in the same line with.

Absinthe, is a liqueur consisting of alcohol, holding in solution the active principles of the wormwood (*artemisia absinthium*), and several other aromatic plants. It is used with water as a drink, has an agreeable taste, and is said to provoke appetite; but it acts considerably on the nervous system, and is very prejudicial to the health if taken too frequently.

Abyssinian Tea, the dried leaves of the *Catha edulis*, used by the Arabs as a substitute for China tea.

Acacia, an extensive genus of trees or shrubby plants of the Mimosa tribe, generally inhabiting the tropical parts of both the old and new world. Some of the species yield gum arabic, gum senegal (Fig. 1), and catechu; others yield a large quantity of tannin. They are generally very ornamental trees. The silk-tassel *A.*, cultivated in the temperate parts of Europe and America, is remarkable for its light, airy foliage, and for the great beauty of its clusters of lilac flowers.


Fig. 1.—Acacia Verek.

Academy, in popular phraseology a school; thus there are educational academies, dancing academies, etc.

Acajou, the French term for mahogany.

Acajou-nut, a German name for the cashew-nut.

Acceptance of Bill, is an engagement on the part of the drawee to pay a bill in full if the *A.* is unlimited. According to the usual practice, the acceptor writes the word "accepted" on it, and signs his name. Though no condition can be appended by the drawee of a bill, it may be by the acceptor, and he will not be responsible till the condition be fulfilled. The holder is not bound to take a conditional *A.*, but if he do so he will be held to have made his election. To preserve the responsibility of drawers and indorsers entire, notice of a condition to an *A.* should be immediately sent them. By custom, the drawee is allowed twenty-four hours, or till next day, to consider whether he shall accept, unless the post leave in the interim. If *A.* be refused or delayed, a protest should be taken, and notice should immediately be transmitted to any party liable, intimating the non-acceptance, and that recourse is to be had against him. *A.* cannot be withdrawn after the bill is returned to the holder.—A bill may be accepted by procuration, but the holder is not bound to take such *A.*, unless a claim and express authority from the principal be produced. *A.* is held as recognition of the drawer's signature, so as to preclude the acceptor from pleading against an onerous holder that it is forged; but it is not held on admission of an indorser's signature, though the acceptor must be considered bound to notice any condition attached to an indorsement. The payee, by accepting, transfers the debt from the drawer's shoulders to his own; he is thenceforth considered the party liable; and after the bill is in circulation, when it is paid, it is presumed to be with the acceptor's funds. Although the bill were not drawn for value, the acceptor is presumed to have had value for it, and he can only reargue the presumption by evidence, unless it be admitted by the party on oath that there was no value.

Acceptance for Honor or *Supra Protest* is an engagement to pay the bill if not paid by the drawee, entered on after it is protested against the latter for non-acceptance. It is performed by a party who professes to be under no obligation to accept, and for the purpose of preventing the bill from being returned dishonored. It may be by a third party, in the absence of, or on the refusal of the drawee himself, who refuses to accept the draft of the drawer, but accepts for the honor of an indorser. The drawee may even refuse to accept the bill absolutely, and may then, after protest, accept for honor of the drawer. The acceptor for honor only renders himself liable in a recourse, in case of non-payment by the proper party, and so the bill should be presented to the drawee for payment when it falls due, notwithstanding his refusal to accept it. The acceptor for honor has recourse against the person for whose honor he has accepted, and succeeds to whatever claim that person may have against the drawee.

Accommodation, a significant term applied by merchants to the credit fabricated by means of a bill of exchange, drawn solely for the purpose

of being discounted, and not sanctioned by an actual sale of goods. Such a bill is called an *accommodation-bill*, also a *wind bill*, a *kite*, or a *fictitious bill*. *A.* bills are of various kinds. The following description of one may suffice: A being in want of $500, requests B to accept a bill drawn at two months, which B, therefore, on the face of it, is bound to pay; it is understood, however, that A will take care either to discharge the bill himself or to furnish B with the means of paying it. A obtains ready money for the bill on the joint credit of the two parties. A fulfils his promise of paying it when due, and that concludes the transaction. In general, *A.* bill transactions are carried on for the joint benefit of the parties, by means of *cross acceptances*, or bills mutually drawn, accepted, and exchanged; and when two names are not enough, others are obtained sufficient to give currency to the bills. The payment of these bills is, among needy men, provided for by their again reciprocally drawing upon each other; and this is repeated until, the system of expedients failing, insolvency sooner or later overtakes the principal parties, and, not unfrequently, all who are brought within the circle of their operations. The loss of credit which the use of accommodation paper, when once perceived, generally occasions, the higher rate of discount, and particularly the double liability for the terms for which cross acceptances are given, should deter the respectable merchant from having recourse to this dangerous expedient. But it must be admitted, at the same time, that when, from some unexpected events or commercial revulsion, a merchant is unable to bring his commodities to a fair market so as to meet his payments, his credit may be saved by the temporary assistance of friends, through the medium of bills, and he may be enabled to hold his goods till some proper opportunity of sale presents itself; and (although such contingencies cannot be too anxiously guarded against) there are perhaps few who have transacted business long and extensively, who have not, at particular times, received support in this way. An *A.* bill differs in no respect from the form of an ordinary bill; its legal effect, however, is different as respects parties between whom they do not represent a real debt. The drawer is generally the person accommodated, the acceptor not being indebted to him, but merely putting his name on the bill to give it currency in the market; if he has to retire it, therefore, the drawer becomes his creditor. That the paper is merely an *A.* bill, as between any two parties who appear on it, cannot, however, be a defence against a third who has given value to it, and even though he knew it to be an *A.* bill when he took it, he has the ordinary means of obtaining payment. A person who appears as debtor on a bill or note is always presumed to have had value, and in a question with the immediate creditor, he must prove want of value by evidence. In a purely *A.* bill, the drawer is not entitled to notice of dishonor, the use of notice being to enable the drawer to take precautions for his safety and indemnification, if he has funds in the drawee's hands; but it can never be safe to omit notice, for if the drawer had at any time, from the period of drawing to that of acceptance, funds in the drawee's hands, he is entitled to notice. See ACCEPTANCE, BILL, NOTICE.

Accordion. See HARMONIUM.

Account, a term applied generally to a computation, reckoning, or statement of anything by numbers.—*Account-current* is a statement of the transactions between two parties, drawn out chronologically in a plain circumstantial manner, and disposed in the form of debtor and creditor in opposite pages.—*Account sales* is a document giving a detailed statement of the sale of goods. It exhibits the quantities and value of the gold sold, the attendant charges, and the net proceeds.

Accountant, a professional or official calculator, skilled in posting and balancing the books of merchants or companies.

Account-book, is a ruled book for entering details of receipts and expenditures.

Accoutrements, the military dress, fittings, and equipage of a soldier.

Accrue, to increase; to appear as profits.

Aceite, a Spanish name for oil.

Acetic Acid, formerly called *radical vinegar*, is the sour part of vinegar, and that to which its peculiar and valuable properties are owing. It is obtained, 1st, by the fermentation of saccharine matter; 2d, by the distillation of wood. The product of the former constitutes, when diluted, the common vinegar, which in France, etc., is made from wine, and in this country from an infusion of malt, termed *wort*. The *A.* acid from wood is obtained by the destructive distillation of the dried branches of trees in hollow iron cylinders. The hard woods, such as oak, ash, birch, and beech, are alone used; and the average product of crude acid from 8 cwts. of wood is 35 gallons. This acid, formerly called pyroligneous acid, is now largely employed, when purified, for almost all the purposes to which acetic acid or common vinegar is applied. *A.* acid, when pure, is fluid (except at a low temperature, when it crystallizes), volatile, and colorless, of an exceedingly pungent smell, and very acid taste. In this state it is used in chemical investigations. In a less pure state it is employed for preparing acetate or sugar of lead, acetate of copper or verdigris, and acetate of alumina, largely used by calico-printers and dyers as a mordant. In the form of pyroligneous acid it is employed to preserve meat, etc., and in the state of vinegar it is applied to a variety of purposes too well known to require notice. *A.* acid is frequently adulterated with sulphuric acid, which, however, is readily detected by the addition of acetate or sugar of lead, when an insoluble sulphate is precipitated should any sulphuric acid be present. *Import duty*, 30 cts. per lb. when sp. gr. is above 1·047, and 5 cts. per lb. when it is not above 1·047. See VINEGAR.

Acetometer, a species of hydrometer, for testing the strength of acids.

Achat, the French name for a purchase.

Acheteur, the French name for a purchaser.

Achiote. Same as ANNOTTO, q. v.

Achira, is a plant of Central and S. America, a species of *Canna*, with a large esculent root, which yields a quantity of starch said to be superior to the ordinary arrow-root.

Achita, in the East Indies, a cartload of ten Charas, or about two tons.

Achtel, in Germany, the eighth part of a weight or measure; also an old measure for grain.

Acidimeter. Same as ACETOMETER, q. v.

Acids, a most important class of chemical compounds, distinguished by the following general properties: — 1. Their taste is for the most part sour; and in the stronger species it is acrid and

corrosive. 2. They generally combine with water in every proportion, with a condensation of volume and evolution of heat. 3. With a few exceptions, they are volatilized or decomposed at a moderate heat. 4. They usually change the purple colors of vegetables to a bright red. 5. They unite in definite proportion with the alkalies, earths, and metallic oxides, and form the important class of *salts*. This may be reckoned their characteristic and indispensable property. Some acids are gaseous in form, others are fluid or solid. Most of them are colorless; some are inodorous; while others are pungent. The most important, in a commercial point of view, are the Acetic, Benzoic, Boracic, Citric, Gallic, Hydrochloric, Nitric, Nitrous, Oxalic, Prussic, Sulphuric, Sulphurous, and Tartaric; an account of which will be found under these several heads.

Fig. 2.—ACONITE.

Acidulous Waters, mineral waters which contain free acids in solution.

Acier, the French name for steel.

Acknowledgment, a receipt; an admission.

Aconite, MONK'S-HOOD, or WOLF'S-BANE, a European plant (*Aconitum napellus*) cultivated in gardens for its handsome purple flowers (Fig. 2). From its roots is prepared the powerful alkaloid *Aconitine*, one of the most virulent of poisons, but, at the same time, a very valuable medicine.

Acorn, the seed or fruit of the oak, used in medicine, and also as food in the form of bread in some parts of the East. The *A.* of the Italian oak, which is quite sweet, is roasted, ground, and sold as a substitute for coffee. *Imp.* duty on *A. coffee*, 3 cts. per lb.

Acorn Cups. See VALONIA.

Acorus, or *Sweet Flag*, a medicinal plant (*Calamus aromaticus*), found in moist situations in many parts of Europe and Asia, and chiefly imported from England. It is slightly aromatic, and is occasionally used as a stimulant. The part employed is the dried creeping stem, improperly termed root, which should be chosen tough, cleared from fibres, and free from worms—to which it is very subject.

Acquittance. See RECEIPT.

Acre, a measure of land. The imperial standard acre contains 4 roods, 160 sq. perches, 4840 sq. yards, or 10 sq. chains; and 640 acres make 1 sq. mile. 1 Scots acre = 1·2612 imp. acre; or 134 Scots acres = 169 imp. acres nearly. 30¼ Irish acres = 49 imp. acres. 1 imp. acre = 0·4047 French hectare; or 42 acres = 17 hectares nearly.

Acrospire, is a name given by maltsters to the sprout or plumula of barley when germinating.

Actinometer, an instrument for measuring the intensity of the rays of the sun. The *A.* built by Arago (Fig. 3) consists of two mercurial thermometers, enclosed in glass pipes A and B, in which the vacuum is made, and one of these glass pipes is blackened. In the dark, the two thermometers mark always the same temperature, but during the day, even when there is cloudy weather, the thermometer with a blackened glass pipe marks a higher temperature than the other. The difference between the respective temperatures is the *actinometric degree* or measure of solar radiation.

Action, is the French name for share; hence the owner of an *A.* in a company is styled *actionnaire*—equivalent to our shareholder.

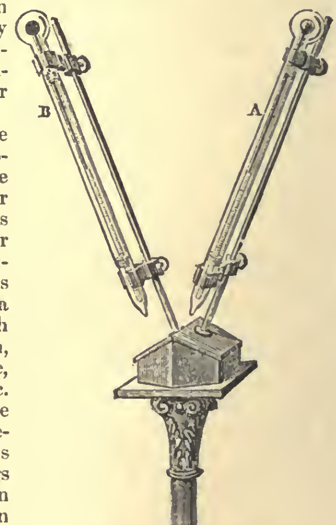


Fig. 3.—ACTINOMETER.

In Music, the term *A.* is applied to the *movements* or working parts of a stringed or wind instrument, which is operated by a key-board, such as an organ, piano-forte, melodeon, etc. It includes the portion between the keys and the strings—the portion engaged in *striking* and *damping*. The Actions are known by a peculiarity in the instrument, as grand, square, piccolo, single, double, upright actions.—*Knight.*

Actuary, a person skilled in the doctrine of life annuities and insurances, and whose business is to give opinions upon cases of annuities, reversions, etc.

Adamantine Spar, or *Common Corundum Stone*, is, with exception of diamond, the hardest substance known. Sp. gr. 4. It contains about 90 per cent. of alumina, with a little iron and silica, and is generally of a pale gray or greenish color, but sometimes of red and brown tints. It is found in India, China, and some parts of Europe. The Indian variety is considerably whiter than the Chinese, and is considered the purest.

Addendum, something added to.

Addressing Machine, is a machine for addressing newspapers and magazines, in which the same series of names is repeated from time to time as the day of issue recurs. There are two modes. One is to print the addresses consecutively upon slips which are gummed on the back and fed intermittingly to the cutter, which cuts off each address. This is then pressed upon the folded paper or pamphlet, which is placed in position to receive its direction. The other mode is to set up the type of each address in a form, and so arrange the forms that they are necessarily presented at a spot to which the enveloped papers are consecutively fed. Over 20 patents have been granted in the United States on machines for this purpose.—*E. H. Knight.*

Adelaide. See SOUTH AUSTRALIA.

Adelantadillo, red wine, made of the first ripe grapes in Spain.

Aden, a seaport of the S. coast of Arabia, lying in 12° 52′ N., 44° 59′ E., 118 m. from the entrance to the Red Sea, belonging to Great Britain, and under the administration of the government of Bombay. It is a place of considerable strength, its situation between Asia and Africa resembling that of Gibraltar between Europe and Africa. Its excellent port renders it a valuable station on the way from India to Europe as a coaling depôt. Its trade is almost exclusively with England. *Pop.* 22,000.

Adhesive Felt, is a cloth used for covering ships' bottoms. It is chiefly imported from Belfast and Glasgow. *Imp.* free.

Adirondack R.R. runs from Saratoga Springs to North Fork, N. Y., a distance of 60 m. This Co., whose offices are in New York city, was chart. in 1839 to construct a R.R. from Saratoga to Ogdensburg, N. Y., 185 m., and was completed to its present terminus in 1870. In 1874 it was placed in the hands of a receiver, by whom it has since been operated. *Financial statement* 30 Sept., 1877:—Cap. stock authorized, $5,000,000; issued, $4,263,000 less $500,000 held by trustees for adjustment of claims. Funded debt authorized, $6,000,000. Bonds issued, $640,000, interest 7 per cent. Floating debt, exclusive of interest and commissions, $1,971,734.68. Total liabilities, $6,374,734.68.

Adjustment, in *Marine Ins.*, a calculation of the sums to which the insured is entitled from the respective underwriters, on a loss occasioned by any of the risks insured against, generally prepared by a professional person, indorsed on the policy, and signed by the several underwriters. It is compared to a note of hand, being presumptive against them, and not requiring the consideration to be proved by the holder, but admitting of a valid defence being raised and proved by the underwriters. See Loss, Policy.

Adjutage, the tube through which a fountain is played.

Admeasurement. See Tonnage.

Admiralty Court, the name of the English supreme marine tribunal which holds jurisdiction over causes arising on the high seas and coasts. In the United States the admiralty cases are under the exclusive jurisdiction of the District and Circuit Courts.

Adrift, a sea term for loose or unfastened; a boat broken away from moorings or fastenings.

Adulteration, the injuring or debasing by foreign or spurious admixtures. There are several kinds of *A.*: conventional, to suit the taste and demands of the public; accidental or unintentional, arising from carelessness in the preparation of the staple or commodity at the place of growth or shipment; fraudulent, for deception and gainful purposes. In Pennsylvania, and other States, *A.* of articles of food and drink, and of drugs and medicines, is made a misdemeanor, punishable by fine or imprisonment, or both.

Ad Valorem, [Lat.] according to the value. This term is used in commerce chiefly in reference to those duties (hence called *ad valorem duties*) which are levied on commodities at certain rates *per cent.* on their value.

Advance, usually denotes money paid on the security of property consigned or deposited. Merchants frequently advance from one-half to two-thirds of the value of goods consigned to them on receiving invoice, bill of lading, etc.

Adventure, a term sometimes used to express a shipment by a merchant on his own account. A *joint adventure* is when the shipment is made by two or more parties on joint account.

Advice, in commercial language, means information communicated by *letter*. The term is used chiefly in reference to bills of exchange. Bills are sometimes made payable "as per advice;" at other times "without further advice;" and generally without any of these words. In the former case the drawer may not, but in the latter he may, pay before he has received advice.

Adze, a tool (Fig. 4), especially valuable to shipwrights, differing from the axe in having a curved blade, whose edge is at right angles to the handle, while the blade of the axe is parallel to the handle. Its forms and sizes differ with the character of the work, and in some cases the bit is gouge-shaped in addition to its curve in the plane of its motions. The blade is usually from 2 to 4 lbs. in weight.

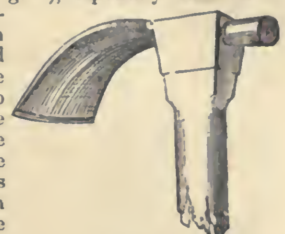


Fig. 4.—Adze.

Aerated Waters. See Soda Water.

Affidavit, a declaration in writing, made on oath before a magistrate or some competent officer.

Affreightment, in *Shipping*, is the contract by which a vessel, or the use of it, or the use of some part of it, is let out on hire. The contract is of two kinds: *charter-party* and *general ship*, or *ship on general freight*. The contract does not require to be in writing. The obligations, generally expressed, and always understood, on the part of the shipmaster, are, that the vessel must be seaworthy, provided with all necessaries, and in every way fit for the voyage undertaken. The crew, also, must be sufficient in number and ability. Where such is the usage, he must have a pilot on board. The vessel must be at the port, ready to receive goods, for a reasonable period, and must sail at the appointed time, weather and tide permitting. She must be properly navigated, and also directed to her port of destination by the usual and approved course. If she deviate unnecessarily, the master and owners are responsible if loss be occasioned, though it should be by the act of God or the republic's enemies. The master must not incur risk by sailing with contraband goods on board, or without the proper papers. He must use every effort to convey the cargo in safety. When he cannot proceed on his own ship, he must forthwith adopt such means as may be best suited to preserve the safety and value of all the property committed to his charge. Trans-shipment for the place of destination, if it is practicable, is the first object, because it is in furtherance of the original purpose; if that be impracticable, return or a safe deposit may be expedient. The merchant should be consulted, if possible. A sale is the last thing a master should think of, because it can be only justified by that necessity which supersedes all other laws. If he sell without necessity, his owners, as well as himself, will be answerable to the merchant. On his arrival, the master must report his

ship and crew, exhibit his manifest, and deliver the cargo to the consignee on payment of charges. (See BILL OF LADING, FREIGHT.)—The obligation on the part of the freighter or merchant, is to furnish a sufficient cargo—if he has covenanted for a full one, he must provide it, though it exceed what was specified as the burthen of the ship, becoming liable in compensation for any portion not occupied. This compensation for the freight of cargo stipulated for, but not supplied, is called *dead freight*. Certain days are generally specified, during which the merchant is entitled to delay the vessel in loading or unloading; these are termed *lay-days*. A specific sum is, in some cases, covenanted to be paid, should the vessel be longer detained, and if a rate is not agreed upon, a charge may be made of the nature of damages. (See DEMURRAGE.) Before receiving delivery of the cargo, the consignee must pay the freight.

Afloat, merchandise which has arrived at the port or in the harbor, but still on board the vessel.

African Hemp, one of the names of the fibre obtained from the leaves of the *Sanseviera Guineensis*. This plant grows also in Ceylon, from whence the fibre is more frequently obtained. *Imp.* free.

Agar-Agar, a sea-weed (*Sphærococcus spinosus*), forming a large article of commerce in the Eastern seas, being used for making jellies, and for stiffening purposes.

Agaric, a fungus (*Boletus*) growing on trees. The *boletus ignarius*, commonly called *Amadou*, was formerly valued as a styptic, but is at present chiefly used for preparing the tinder or touchwood called *Punk*, or *German tinder*. It is found in most countries, on the trunks of old ash and other trees. That which grows upon the oak (Fig. 5), however, is most esteemed.

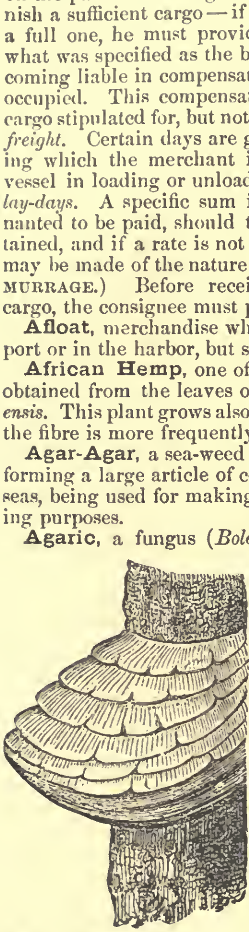


Fig. 5.—AMADOU OF THE OAK.

Agate, [Ger. *Achat*,] a well-known stone used in jewelry and the arts, and popularly called *Scotch pebble*. It is one of the modifications of form under which silica is found in almost a state of purity. The silicious particles are not arranged so as to produce the transparency of rock crystal, but a translucent, sometimes almost opaque, substance, with a resinous or waxy fracture; and a variety of shades of color are produced by a minute quantity of iron, for the beauty of which, together with the high polish they are capable of receiving, *A.* are highly prized as ornaments. They are usually met with in that variety of trap rocks called amygdaloid or mandelstein. They vary in size from that of a pin-head to a foot in diameter, but those of one to three inches are the most common. They are found in many parts of Scotland, Sicily, etc.; but the principal supply is procured from Oberstein, in Germany. The stones known by the names of Carnelian, Chalcedony, Onyx, Sardonyx, Mocha-Stone, Blood-Stone, Chrysoprase, and Plasma, are closely allied to *A.*

Agave, AMERICAN ALOE, or MAGUEY, is a succulent plant, cultivated in Mexico, and from which is obtained a valuable fibre used for mats, for brushes, and as a substitute for curled horsehair for stuffing cushions. From it also the Mexicans obtain a favorite drink, called *pulque*, or agave wine. From pulque an ardent spirit is distilled, which is known by the name of *Mezcal* or *Aguardiente de Maguey*.

Age, the time when a person assumes legal authority to act for himself or herself. According to American law, a person becomes of age when he or she is 21 years old. Before this age one cannot make a valid commercial contract.

Ageing, in calico-printing, a process by which a mordant, after being applied to a cotton fabric, is placed in circumstances favorable to its being completely incorporated with and fixed in the fibre.

Agenda, a list or memorandum-book of business to be done.

Agent. See PRINCIPAL AND AGENT.

Agent de Change, the French name for a stock-broker.

Agio, a term applied in some parts of Europe to the premium or percentage allowed on a better sort of money when it is given in exchange for an inferior kind. Thus, at Hamburg, when 100 marks banco are exchangeable for 120 marks currency, the *A.* on banco is said to be 20 per cent.; it being always reckoned upon the more valuable money. In France, again, where payments can be demanded only in silver coin, a small premium is sometimes paid by the receiver in order to obtain gold coin; this premium is called the agio on gold.—When the percentage, or difference, is considered with regard to the inferior sort of money, it is called *discount*. Thus, when $100 in notes were exchangeable for only $90 in gold, the discount on the paper was said to be 10 per cent.

Agiotage, the French term for stock-jobbing, speculation on the rise or fall of the public funds.

Agreement, is a mutual bargain, contract, or covenant. Every State has particular laws on this important matter. It may, however, be noticed, as a general rule, that every *A.* that, by its terms, is not to be performed within one year from the making thereof; every special promise to answer for the debt, default, or miscarriage of another person; and every contract for the sale of any goods, chattels, or things, for the price of $50 or more, is void, unless, 1st, a note or memorandum of such contract be made in writing, and be subscribed by the parties to be charged thereby; or, 2d, unless the buyer shall accept and receive part of such goods, or the evidence, or some of them, of such things in action; or, 3d, unless the buyer shall, at any time, pay some part of the purchase-money.

Agricultural Implements, are the various mechanical implements and tools used for tillage, garden, nursery of plants, and stable. These are treated in this work under their respective heads. Many of them, manufactured in the U. States, command a ready sale in the European markets. Their exportation, which is continually increasing in importance, amounted to $2,623,722 for the year 1878.

Aground, stranded; applied to a ship or vessel touching the bottom.

Aguardiente, a name for alcohol, principally applied to brandy in Spain.

Ahm, an old German liquid-measure, varying in different places from 36 to 41½ gallons.

Aigrette, a pointed tuft of feathers, jewels, etc.

Air-Bed, an India-rubber or other air-proof case or mattress inflated with air for the use of invalids.

Air-Cushion, an inflated seat for railroad-carriage, chairs, etc.

Air-Gun, a pneumatic machine for projecting bullets, in which the moving power is the rush of condensed air allowed to escape.

Air-Pump, a pneumatic machine for producing a partial vacuum. It substantially consists (Fig. 6) of a circular brass plate, on which is placed a bell-glass called a receiver, and two vertical brass cylinders, each of which has a piston attached. A hole in the centre of the plate, and a connecting tube, form a medium of communication between the receiver and the cylinders. The air is expelled from the latter by a movement of the piston; a portion of the air then escapes from the receiver, and a valve is placed at the orifice of the connecting tube, so that no air can return to the receiver. Another valve in the piston opens outwardly and allows the air to have vent.

Akee, is a tree (*Cupania sapida*), a native of Guinea, and transplanted to the West Indies. Its reddish-yellow fruit, about the size of a hen's egg, is highly esteemed in Africa, having an aril with a grateful subacid flavor.

Akey, the money standard of the Gold coast of Africa. As a weight for gold-dust it is considered to be equal to 20 grains.

Alabama, a Southern State of the U. States, bounded N. by Tennessee, E. by Georgia, S. by Florida and the Gulf of Mexico, W. by Mississippi. It lies between 30° 10′ and 35° N. lat., and between 85° and 88° 30′ W. lon.; area, 50,722 sq. m. Improved land, 4,982,340 acres; unimproved land, 9,491,270, of which 8,034,700 acres are woodland. The soil of the State is various, but mainly productive. In the southern part there are considerable tracts of sandy barrens, but the river bottoms are remarkably fertile. Some portions of the highlands in the north are not worth cultivating, while by far the greater portion is very excellent land, having a productive soil of variable depth, resting on a limestone bed. *A.* has numerous navigable rivers, the principal of which are the Mobile, Alabama, Tombigbee, Chattahoochee, Coosa, and Tennessee. The great river of the State is the Mobile, formed by the confluence of the Alabama and Tombigbee, about 50 m. above Mobile Bay, into which it empties at Mobile. The Tombigbee rises in N. E. Mississippi, and is navigable for light-draught steamers to Columbus, about 300 m. The Black Warrior, a branch of the Tombigbee, has its source in N. Alabama, empties near Demopolis, and is navigable for steamers to Tuscaloosa, 285 m. from Mobile. The Alabama, which is the eastern branch of the Mobile, is navigable to Montgomery, about 320 m. The sea-coast is broken by Mobile Bay, a beautiful sheet of water, 30 m. in length and from 30 to 18 m. in breadth, with 22 feet of water at the main entrance at low tide; but the channel for 10 m. below Mobile is not more than 8 to 9 feet deep at low tide. The climate of *A.* is healthy, except in the low river-bottoms, where the prevailing diseases are intermittent, congestive, and bilious fevers. The mean temperature of the State is about 63°, and the mercury seldom rises above 95°. Agriculture forms the principal occupation of the people, manufacturing being carried on only to a limited extent. The chief productions are cotton and Indian corn. In 1878 there were in the State 205,000 milk cows, 375,000 oxen and other cattle, 270,000 sheep, 952,300 hogs, 108,500 horses, and 105,400 mules. *A.* has 1,496 m. of completed railroad. The principal cities are Mobile, Montgomery (the cap.), Huntsville, Selma, Madison, Tuscaloosa, and Gainesville. *Pop.* 996,992. The maritime commerce of *A.* is almost concentrated at Mobile. See MOBILE.

Fig. 7.—SEAL OF ALABAMA.

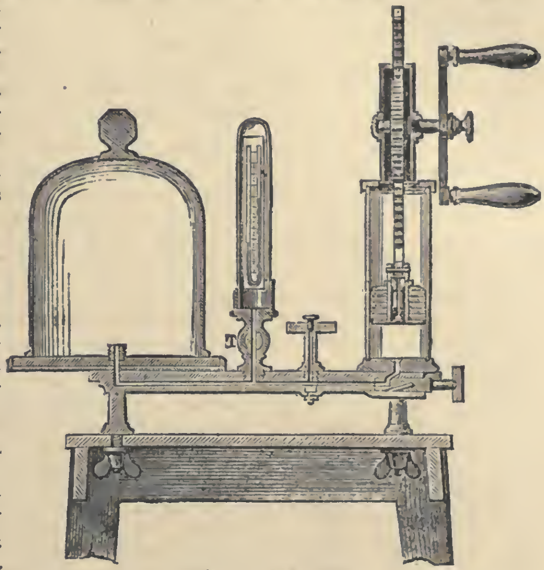


Fig. 6.—AIR-PUMP.

Alabama Central R.R., runs from Selma to York, Alabama, a distance of 81 m. This Co., located at Selma, was chartered in 1850, under the name of Alabama and Mississippi R.R. Co.; assumed later the name of the Selma and Meridian R.R., and was reorganized under the present title in 1871. *Financial Statement:* Cap. stock, $2,000,000; funded debt, $1,600,000; bills payable, $316.73; other liabilities, $9,587.61; total, $3,609,904.34. Bonds issued by the Selma and Meridian Co. in June, 1871, bear interest @ 8%, payable in Jan. and July, and become payable July 1, 1901. Net earnings for 1877, $86,487.83.

Alabama Great Southern R.R., runs from Chattanooga, Tenn., to Meridian, Miss., 296 m. Office at Montgomery. It was chart. in 1853, under the name of N. E. & S. W. Ala. R.R., was reorganized in 1868 as Ala. and Chattanooga R.R., was taken possession of by the State of Ala. in 1872, was sold in 1875 to the 1st mortgage bondholders, and lastly, in 1877, to Erlanger and Co.,

of London, who, on November 30th of same year, organized the present Co., the State of Ala. having appropriated $1,000,000 State bonds, bearing 2% interest until 1 Jan., 1881, and thereafter 4% for 25 years, for redemption of the endorsement of the Ala. and Chattanooga R.R. bonds. *Financial Statement.* The cap. stock of the new Co. is fixed at $783,000 preferred and $7,830,000 common; total stock, $8,613,000; funded debt, $1,750,000; total stock and bonds, $10,363,000. Net earnings for the year ending Feb. 28, 1878, $99,593.99, applied to reconstruction purposes.

Alabaster, [It. *alabastro;* Fr. *albâtre,*] a species of gypsum resembling marble, but softer, takes a duller polish, and when pure is much whiter and semi-transparent. Some stones, however, of a veined and colored appearance, and also certain transparent and yellow ones of a sparry nature, are termed *A.* It is used for small statues, lamps, vases, and other ornaments. The finest is found near Volterra, in Tuscany. It is also procured in great abundance on the shores of the British Channel, between Watchet and Minehead, where it is manufactured into toys and ornaments.

A la Mode, the French term for fashionable.

Alarm-Bell, or ALARUM, is a watch or clock that strikes at a particular hour. An ordinary clock strikes on a bell every half hour; and, by a small addition to the apparatus, it can be made to strike at any intermediate time, or to give a ringing succession of sounds loud enough to wake a sleeper. The alarum can be "set" beforehand, so as to act at the required time.

Alaska, an immense territory of the United States, extending from lat. 54° 40′ N. up to the Glacial Ocean, and between 131° and 170° lon. W., including the greater part of the Aleutian Islands, and sold in 1868 by Russia to the United States

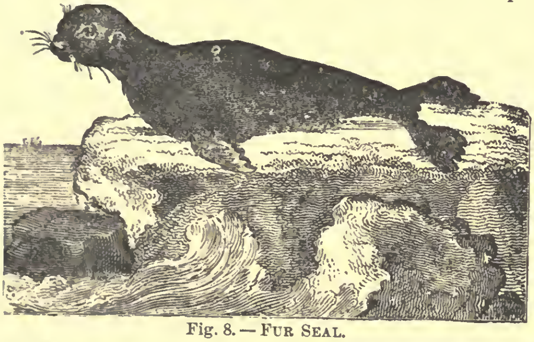


Fig. 8. — FUR SEAL.

for $7,500,000. The principal settlement is at Sitka, a town of about 500 inhabitants, situated in the easternmost part of Sitka Sound, on the W. shore of Baranoff Island, in lat. 57°. The natives of *A.* number about 50,000, consisting of Esquimaux and kindred tribes and Indians. The European pop. is not above 1,000. The climate is by no means so inhospitable as that of corresponding latitudes on the eastern coast of North America. At Sitka the mean annual temperature is 42·9 F., the lowest being 31·1, in Jan., and the highest 55·8, in Aug. The Aleutian Islands are wholly destitute of trees, but the interior of *A.* is well wooded, and dense forests of the Sitka spruce or white pine produce timber of great size and unsurpassed quality. On the coasts are found the fur seal (Fig. 8), the sea-lion, the sea-otter, and the walrus. Whales, cod, herring, and halibut are abundant in the adjacent seas, and immense quantities of salmon are caught in the Alaskan rivers. The fur trade and the fisheries are the leading industries of *A.* The taking of fur seals, which is for the most part restricted to the Pribyloff Islands, is now regulated by act of Congress, the privilege being under rental to the "Alaska Commercial Co.," at $55,000 per annum. In 1878 that Co. took the maximum number of 100,000 skins allowed by law, upon which the tax due the government was $262,500 (besides the rental). The annual product of the fishery in salted codfish alone, is about 10,000,000 lbs. Timber is exported in limited quantities. Amicable relations have, generally, been sustained between the Indians and whites in *A.* Some outrages, however, occurred in the last months of 1878, and the collector of customs at Sitka—the only officer exercising some authority on the main-land—stated that bloody outbreaks might be apprehended at any time in consequence of the means now existing for producing intoxicating liquor, and from the lack of any organized government in the Territory.

Alb, or ALBA, a white surplice of muslin worn under the vestment by Catholic priests.

Albany, a city of the United States, cap. of the State of New York, at the head of sloop navigation and near the head of tide-water, on the W. bank of the Hudson River, lat. 42° 39′ 3″ N., lon. 73° 32′ W., 145 m. N. of New York city, 164 m. W. of Boston, and 370 m. N.E. of Washington. It is a port of delivery for foreign merchandise, and an important mart or entrepôt for the products of the Western States passing through the canals, which have their terminus here. *A.* has a very extensive trade in grain, and its lumber market is perhaps the largest in the world; its manufactories are also very important and extensive. *A.* has 9 banks, 6 savings banks, 6 insurance companies, and about 15 periodicals. The steamboats plying on the Hudson River between New York and *A.* are among the largest that navigate any inland waters. *Pop.* 80,000.

Albany and Susquehanna R.R., runs from Albany to Binghampton, in New York State; distance, with branches, 17,695 m. Offices in New York. Organized April, 1851, and leased for 99 years from 1st March, 1870, by Delaware and Hudson Canal Co., for interest and dividends equal to 7% on $7,000,000, the amount of stock and bonds then outstanding. *Financial Statement.* Cap. stock paid in, $3,500,000; funded debt, $6,045,000; total, $9,545,000; cost of construction, $7,374,745.28; equipment, $1,698,692.97; real estate, $845,028.30; other liabilities, $373,461.55; total, $9,918,461.55. *Funded Debt.* 1st mortgage issued 1863, payable 1888, $1,000,000, 7% interest (Jan. and July); Albany City loan, issued 1865, payable 1895, $1,000,000, interest 7% (May and Nov.); 2d mortgage issued 1865, payable 1885, $2,000,000, interest 7% (April and Oct.); 3d mortgage issued 1869, payable 1881, interest 7% (May and Nov.); amount authorized, $500,000. Amount outstanding, $85,000. *Consolidated Mortgage* issued 1876, payable 1906, interest 7% (April and Oct.). Amount authorized, $10,000,000. Amount outstanding, $1,977,000. Net earnings for 1878, $456,579.68.

Albata, *British plate* or *German silver*, a compound of tin, copper, and nickel, extensively used in England in the manufacture of a variety of articles which were formerly plated or made entirely of silver. *A.* goods do not look so well as those plated, when the latter are entirely new, but they possess superior durability. Birmingham and Sheffield are the principal seats of this manufacture.

Albertite, a highly bituminous mineral found in New Brunswick, which has proved valuable for making illuminating gas, and also for the manufacture of various liquid hydro-carbons and illuminating and lubricating oils, which are distilled from it.

Album, a book kept for the writings and inscriptions of friends; also a book for keeping photographs, etc.

Albumen, a constituent of the animal and vegetable fluids and solids, which enters into commerce in a dried state; chiefly the *A.* of the egg and of blood. The principal use of *A.* is in photography and calico-printing. *Imp.* free.

Albumenized Paper, paper prepared for printing photographs on; also an imitation of parchment, prepared for steeping paper in sulphuric acid.

Alcarrazas, the Spanish name for porous unglazed earthenware coolers.

Alcohol, [Fr. *alcohol* and *esprit de vin;* Ger. *weingeist*,] is a liquid which forms the intoxicating principle of fermented liquors. It is by the distillation of such liquors that ardent spirits are obtained, and they receive the names of brandy, rum, gin, whiskey, according to the nature of the substance employed, but in every case consist almost entirely of three ingredients, viz., alcohol, water, and a little oil or resin, to which they owe their flavor and color. When these liquids are redistilled, the first portion that comes over is a fine light, transparent fluid, known in commerce by the name of *rectified spirits*. When as highly rectified as possible, the sp. gr. of the liquid obtained does not appear to be less than 0·8200, and is generally more. *A.* cannot, by this process, be deprived of the whole of the water with which it is combined; but by redistillation with hot hydrochlorate of lime, it is procured of the sp. gr. of 0·7939 at 60° F. In this state it is the strongest that can at present be procured, and it is therefore called *pure* or *absolute A.* The *A.* of commerce, or *spirit of wine*, is never so strong as this; its sp. gr. is seldom under 0·8370. In this state it is fragrant, limpid, colorless, volatile, inflammable, and of a pungent, agreeable taste. It has never been frozen. At 173½° it boils. It combines with water in every degree; and the proportion of it present in common spirits is best judged of by their sp. gr., and is usually ascertained by a hydrometer. The sp. gr. of what is called pure *A.* being 0·7939 at 60° F., and that of water 1·000, it follows that the lighter a spirit is, the stronger it is. What in this country is called *proof spirits* is understood to be a mixture of equal bulks of *A.* and water. When spirits are weaker than this they are said to be *under proof;* when stronger, to be *above proof:* thus, "10 under proof" signifies that every 100 gallons of that spirit would require to have 10 gallons of water abstracted from it to bring it up to proof; and "10 over proof," that every 100 gallons contain too little water by 10 gallons. *A.* is extensively used in the arts. It dissolves the resins, camphor, and the essential oils; and hence its uses in varnish-making, in pharmacy, and in perfumery; while its fluidity at the lowest temperatures — its antiseptic properties, and its purity and inflammability, render it applicable to a great variety of other purposes.

The duty on imported *A.*, brandy, and spiritnous liquors generally is $2 per proof gallon, the "proof spirit," under the law, being "that alcoholic liquor which contains one-half its volume of *A.* of a sp. gr. of 0·7939 at 60° F. No lower rate or amount of duty to be charged than that fixed for first proof, but to be increased in proportion for any greater strength and none under first proof to pay less than 50 per centum ad valorem. To ascertain the number of proof gallons contained in any quantity of liquor stronger than first proof, multiply the actual quantity in wine gallons by the percentage of *A.*, and divide by 50. Thus, to find the duty on 20 gallons at 108°: $20 \times 108 \div 50 = 21.60$ gallons at $2.00, or $2.16 per gallon."

Alcoholmeter, is a well-known instrument for ascertaining the strength of spirits. The *A.* invented by Pr. Fralle, of Berlin, known as *Fralle's A.*, and now made in New York, is the one in use in the United States custom-houses.

Alcornorco Bark, a bitter and astringent medical bark derived in Venezuela from the *Bowdichia virgiliodes*.

Alder, an aquatic tree (*Alnus glutinosa*), found in all the northern parts of the world. Its timber is reddish-yellow in color, and, being soft, works easily. It is much used for piles, pumps, and other under-ground purposes where it is kept constantly wet; and its stems, hollowed out, are among the best materials, next to metal, for water-pipes. The veiny knots are often cut into veneer. The bark is valuable for tanning; and the young shoots, when mixed with other ingredients, are used for dyeing. The alder rots when exposed to the weather, and when dry is subject to worms.

Ale. See BEER.

Alençon Lace. See BLONDE.

Aleppo, a fine city of Turkey in Asia, in N. Syria, 70 m. E. from the Mediterranean, lat. 36° 11′ N., lon. 37° 10′ E. It was, in the Middle Ages, the great emporium of trade between Europe and the East, and is still the great caravan-centre of traffic with Central Asia. The U. States and most of the European nations have consuls there. *Pop.* 120,000.

Aleurometer, an instrument for determining the quantity of gluten in flour.

Alewife, or GASPERAU, a fish of the herring family (*Alosa tyrannus*), caught in large numbers in the bays and rivers of New England. They are put up in barrels, and are the object of a large trade in Boston.

Alexandria, in Egypt. See EGYPT.

Alexandria, a city and port of Virginia, on the right bank of the Potomac, 7 m. below Washington, in lat. 38° N., lon. 77° 4′ W. It is considerably elevated, ascending gradually from the river, which has here a depth of water sufficient for vessels of the largest class. *A.* has 113 vessels, tonnage 3,821. Its coastwise trade is important. *Pop.* 13,570.

Alexandria and Fredericksburg R. R., runs from Long Bridge to Quantico, Virginia, 32·4 m. Offices at Philadelphia; chartered 1864; possession taken by mortgage trustees 1872; to be reorganized. Cap. stock, $1,000,000; funded debt, first mortgage 7 % gold bonds, dated 1866, payable 1896, $1,000,000; floating debt, $174,756.70, and trustees' debt for preservation of property, $43,540.47; total liabilities, $2,218,261.17. Cost

of road and equipment, $2,165,247.06; balance, profit and loss, $53,014.11. Total resources, $2,218,261.17. Net earnings for 1877, $18,449.96.

Alfa Fibre, is the fibre of the *Macrochloa tenacissima*, and is the most important of the vegetable products of Algeria. It grows spontaneously over vast tracts of country where cultivation of any description is impossible, and covers 10,000,000 acres, from which a quantity of paper-making material may be collected, equal to the three-fourths of all the rags sold and used throughout the world. The exportation of *A.*, in 1878, exceeded 80,000 tons. *Imp.* free.

Agarovilla, the agglutinated seeds and husks of the legumes of a Chilian tree (*Ceratonia siliqua*). It contains much tannin, and is said to possess about four times the powers of good oak bark. It has been occasionally imported in mass.

Algarrobo. See CAROB BEANS.

Algeria, the largest and most important of the colonial possessions of France, extends about 500 m. along the N. shore of Africa, from about 8° 30′ E. to 1° 30′ W. It is bounded on that side by the Mediterranean, E. by Tunis, S. by the Sahara or Great Desert, and W. by Morocco. Its area embraces 258,306 sq. m., being about one-sixth larger than France. There are 3 provinces — Algiers, Constantine, and Oran — which are subdivided into 12 departments. At the head of the colony is a governor-general. The country is traversed by branches of the great mountain-chain of Atlas, and in general is well watered and highly fertile. There are 5,139,136 acres of land under cultivation, of which 8 % are cultivated by the European colonists, and 92 % by the natives. The total imports amount annually to about $40,000,000; exports, $30,000,000. *Pop.* 5,000,000, about half of which consist of wandering Arab tribes.

Algiers, the principal city and port, rises in the form of an amphitheatre, near the middle of the coast, 36° 48′ N., 3° 4′ E. It is defended on the sea-side by very strong batteries. The harbor, a work of immense labor, is formed by two projecting moles, and is about 15 feet deep; but it is unsafe, and vessels lying along it must be strongly fastened by cables. The principal intercourse of Algiers is with France, Italy, England, and Spain. Exports: oil, wax, hides, skins, corn, fruit, wool, rags, cotton, iron ore, Esparto grass or alfa, etc. *Pop.* 58,816. The other chief ports are *Oran*, *Bona*, and *Mostaganem*.—The principal inland towns are *Constantine* and *Philippeville*. The *money*, *weights*, and *measures* of France are in general use among the settled population in the towns.

Alicante. See SPAIN.

Alien, a foreigner or person not naturalized, not a citizen of the U. States. For commercial purposes generally, a foreigner enjoys the same protection and privileges as a natural-born citizen merchant. He is not, however, permitted to own vessels sailing under the national flag, and he cannot act as a merchant-appraiser in cases of dispute between the custom-house officers and merchants as to the value of imported merchandise.

Aliment, any substance which may be used as food.

Alizarine, a fine red volatile coloring-matter, in the form of crystals, found in madder, and which yields the Turkey-red dye.

Alkalies, a class of chemical bodies characterized generally by their peculiar hot, bitter, and caustic taste; by their changing the colors of vegetable blues to green, and yellows to brown; and by their neutralizing acids, and forming with them the class of compounds called salts. The principal *A.* are ammonia, potash, and soda; an account of which, and such others as possess commercial interest, will be given under their proper heads. The value of any *A.* is determined by an *alkalimeter*, a graduated instrument which shows the quantity of acid neutralized by a given weight of the sample, and hence the amount of pure *A.* contained in it.

Alkanet, [Sp. *Arkaneta;* Fr. *Orcanette;* Ger. *Orkanez-wurzel*,] is the root of a species of bugloss (*Anchusa tinctoria*), a native of the warmer parts of Europe. It is of a dark-red color, and white within, and imparts an elegant tint to alcohol, wax, and to all unctuous substances. The coloring matter is confined to the bark, and the small roots are preferred, as these have most bark in proportion to their bulk. The best *A.* is imported from Montpellier in France, and from the Levant. *Imp.* free.

Alkermes. See KERMES.

Alkool, a black dye, a preparation of antimony, used by females in Eastern countries to tinge their eyelids. See HENNA.

Allege, the French term for a tender or lighter for a ship.

Allegheny Valley R.R., runs from Pittsburgh to Oil City, Pa., 132 m.; from Red Bank, a point on its own line, to Driftwood, a point on the Phila. & Erie R.R., 110 m.; and branches, 17 m.; total, 259 m. This Co., located at Pittsburgh, Pa., was chartered in 1851. *Financial Statement:* 1st mortgage River Division, $4,000,000, payable 1896, interest 7.03% (Jan. and July); 1st mortgage Eastern Extension, $10,000,000, payable 1920, interest 7% (April and Oct.); 2d mortgage Eastern Extension, $3,200,000, payable $100,000 per year, interest 5% (Jan. and July); Income bonds, $6,200,400, payable 1894, interest 7% (April and Oct.). Net earnings for 1878, $915,-726.57.

Alligation, in *Commercial Arithmetic*, is a formula for ascertaining the proportion of constituents or ingredients in a mixture.

I. To find what quantity of any number of ingredients, whose rates are given, will compose a mixture of a given rate. *Rule.* — 1. Write down the rates of the ingredients under each other. 2. Connect by a curved line the rate of each ingredient, which is less than that of the mixture, with one or any number of those that are greater, and each greater rate with one or any number of those that are less. 3. Put the difference between the mixture rate, and that of each of the ingredients, opposite the contrary rate with which it is linked. 4. Then if only one difference stand against any rate, it will be the quantity belonging to that rate; but if there be several, their sum will be the quantity.

Example I. Wine at 90 cts. per gallon is to be mixed with wine at 60 cts. per gallon; required the proportions so as to sell the mixture at 70 cts. per gallon.

$$70\left\{\begin{matrix}90\\60\end{matrix}\right] \begin{matrix}\ldots\ldots & 10 \text{ at } 90 \text{ cts. per gal.}\\ \ldots\ldots & 20 \text{ “ } 60 \text{ “ \quad “}\end{matrix}$$

That is, the wine at 90 cts. per gal. must be to that at 60 cts. in the proportion of 1 to 2.

Example II. What quantity of spirits at $1.70, $1.80, and $2.20 per gallon, must be taken, so as that the mixture may be worth $2.00 per gallon.

$$2.00\left\{\begin{matrix}1.70 & \ldots\ldots & 20 \text{ at } \$1.70 \text{ per gal.}\\ 2.20 & .\ \ 30+20=50 & \text{“ \quad } 2.20 \text{ \quad “}\\ 1.80 & \ldots\ldots & 20 \text{ “ \quad } 1.80 \text{ \quad “}\end{matrix}\right.$$

Ans. 2 gal. at $1.70; 5 at $2.20; and 2 at $1.80.

II. When the whole composition is limited to a certain quantity. *Rule.* — Find an answer as

before, by linking; then, as the sum of the quantities, or differences thus determined, is to the given quantity, so is each ingredient found by linking to the required quantity of each.

III. When one of the ingredients is limited to a certain quantity. *Rule.* — Take the difference between each price and the mean rate as before; then, as the difference of that ingredient whose quantity is given is to the rest of the differences respectively, so is the quantity given to the several quantities required.

In the same manner, questions of this kind may be worked where several of the ingredients are limited to certain quantities, by finding first for one limit, and then for another. In general, however, cases in alligation are best solved by an analytical process, as they form what are called *indeterminate* or *unlimited* problems, from their admitting of a variety of answers. See AVERAGE.

Alligator Leather, the New York name for the tanned and prepared skins of the alligator, which come from Texas. They are mottled like tortoise-shell, are as pliable as calf-skin, and are used for boots, etc.

Allotment Ticket, an order for periodical payment of a portion of a seaman's wages to some second party during his absence at sea.

Allowances. See TARE.

Alloy, is a term applied to a mixture of any two metals; but sometimes it is applied only to the baser or inferior of the two, such as copper in standard gold and silver; while if mercury be one of the two, the mixture is more usually called an *amalgam*. Some metals are too brittle, some too soft, to be of much use in their pure or simple state; but there are scores of combinations of them, two and two, which prevent various serviceable qualities; and all such combinations form *A.* Sometimes three or even four metals form an *A.* — In *type-metal*, the qualities of a soft, malleable metal (lead), and of a hard, brittle metal (antimony), are combined to produce a useful *A.* that will possess properties depending on the proportions of the ingredients. The various *A.* of lead and tin, such as *pewter*, differ in quality from the same cause. Copper and tin produce *bell-metal, bronze, gun-metal,* and *speculum-metal;* and it is noteworthy what great differences are observable in these *A.*, according to the proportions between the two components, all other conditions being the same. The change even goes to that extent that an *A.* becomes harder in proportion to the increase in the *softer* of the two metals. That *A.* are chemical combinations, and not merely mechanical mixtures, is shown by the fact that their sp. gr. is seldom a mean between those of the components; and that they are more fusible, or melt at a lower heat, than the most fusible of the two components. The principal *A.* will be found noticed under their proper names, and some others under the names of the simple metals. See also ASSAY.

Allspice, or PIMENTO, [Fr. and Ger. *piment;* It. *pepe garofanato,*] is a small, dry, reddish-brown berry, the fruit of *Myrtus Pimenta*, common on the N. side of Jamaica, whence it is called Jamaica pepper. It is named *A.* from its taste and flavor (qualities which reside chiefly in the cortical part of the berry), being supposed to resemble that of a mixture of cloves, cinnamon, and nutmegs. The berries are gathered before they are ripe, and dried in the sun; the smallest and most fragrant being preferred. The produce of the Pimento crop, though sometimes very abundant, is variable; and there is seldom a plenteous harvest above once in five years. A corresponding fluctuation occurs in the annual importations from the West Indies, whence it comes packed either in bags or hogsheads. The Pimento tree is also cultivated in some parts of the Southern States. Duty on import, 10 cts. (ground) and 5 cts. (unground) per lb.

Almacen, the Spanish name for a warehouse or store-room.

Almandine, a name for the carbuncle or precious garnet.

Almonds, [Du. *amandalen;* Fr. *amandes;* Ger. *mandeln;* It. *mandole;* Port. *amendoas;* Sp. *almendias,*] the kernel of the fruit of the almond-

Fig. 9. — ALMOND BLOSSOMS.

tree (*Amygdalis communis*), which tree, nearly resembling the peach both in leaves and blossoms (Fig. 9), is a native of Syria and Barbary, but now naturalized in the south of Europe. *A.* are of an oblong compressed shape, nutty taste, and are covered with a thick brown skin. There are two permanently distinct varieties,—the *sweet* and the *bitter;* but many subvarieties are distinguished in the places of growth. It is said that the eye can discover no difference between the sweet and bitter *A.*, nor between the trees which produce them. *A.* are now little used in medicine; the sweet are a common article of the dessert; the bitter are used chiefly in cooking to give a flavor to other articles, and by perfumers in the preparation of the *paste of A.*, *milk of A.*, etc. Both become rancid by keeping. They are gathered in August and September, but are not generally shipped till the middle of October. They are imported into this country chiefly from Valencia, Alicante, and Malaga, in Spain; small quantities, besides, are brought from France, Portugal, and Italy. Bitter *A.* are obtained almost wholly from Barbary. The best sweet are the *Jordan* variety, brought from Malaga; they are longer, flatter, less pointed at one end, and less round at the other, and have a paler cuticle than the other kinds. The sweet *A.* are imported in mats, casks, and boxes;

the bitter usually in boxes. The annual imports into the U. States are from 2,000,000 to 3,000,000 lbs. *Imp.* duty (unshelled) 6 cts., (shelled) 10 cts. per lb.

Oil of A. is a fat or greasy substance expressed from sweet and bitter *A.*; sp. gr. 0·915. It is pale yellow, but becomes colorless when long exposed to light. It soon grows rancid, especially if in contact with oxygen. It is imported from England. The essential bitter oil is used in perfumery; the sweet oil is largely used in soap-making, etc. Average cost (duty paid) in New York: (sweet) 50 cts., (bitter) $5.75 per lb. *Imp.* free.

Almude, a variable measure for liquids in several countries. In Portugal, the Lisbon *A.* = 3·7 gallons, and the Oporto *A.* = 5·6 gallons. In Turkey and Egypt, the *almud* = 1·151 gallon.

Aloe Fibre, is the very valuable fibre of aloe, a genus of succulent plants growing in warm countries. It is made into ropes, cables, fishing-lines, etc., and is extensively exported from Algiers.

Fig. 10. — LIGN-ALOE.

Aloes, [Fr. *aloès;* Ger., It., Sp., *aloe,*] a bitter resinous juice, extracted from the leaves of a succulent plant of the genus *Aloe.* It is used as a common purgative medicine. Three kinds are known to druggists, namely, — 1. *Socotrine,* from the island of Socotra, is sometimes imported in chests from the Levant; it is the purest, though seldom to be found genuine in this country; the *A.* imported from the Cape Colony through England is sometimes designated by the same name, but it is much inferior in quality; 2d. *Hepatic,* or liver-colored *A.*, is imported chiefly from Bombay in gourds; a darker kind is brought from Barbadoes; 3d. *Caballine,* known by its rank smell, is used only for horses. These varieties of *A.* are said to differ only in purity, and it is probable that they may be obtained, in some instances, from different species of the same plant. Socotrine *A.* is said to be obtained by only draining the leaves, after being cut at their base; hepatic *A.*, by boiling or slight pressure; and horse *A.* seems to be a coarse preparation from the dregs of the last. Those of best quality are glossy, not very black, but brown; when rubbed or cut, of a yellow color; compact, but easy to break; easily soluble; of an unpleasant peculiar smell, and an extremely bitter taste. *Imp.* free.

Aloe-Wood, AGALLOCHUM WOOD, EAGLE-WOOD, or CALAMBAK, [Fr. *bois d'aloès;* Ger. *aloeholz,*] is procured from the interior part of the trunk of a large tree, the Lign-Aloe (Fig. 10), (*Aquilaria Malaccensis,* and *Aloexylum agallochum,*) growing in some parts of Assam, Cochin, and China. It is of a dark color, and is saturated with a peculiar aromatic resinous matter, which is highly esteemed by Eastern nations. This substance is said to be the produce of disease, as the sound wood is white and inodorous. It is used as a stimulating medicine, as well as an ingredient in incense.

Alpaca, the name of a species of Peruvian sheep (Fig. 11), smaller in size, but closely allied to the llama, and, like it, used in Peru to carry burdens. From its wool is manufactured, sometimes with cotton or silk warp, a plain woven stuff, used for dresses, umbrellas, etc. Nine-tenths of the *A.* wool is black, the rest brown or grizzled. The staple is ordinary 6 inches in length, of a singularly soft and silky quality, and when carefully managed loses nothing of its gloss in dyeing and finishing. It is dyed in the piece, and may be obtained in all colors. It was first manufactured at Bradford, England, which is still the chief place of manuf., but it is also manufactured in France, in Germany, and in the U. States. The wool is chiefly imported from Lima and Buenos Ayres. For import duty, see WOOL and WOOLLENS.

Alpargata, a light kind of sandal or shoe, made of rushes (*Microchlon tenacissima*), worn by the Valencian peasantry.

Alqueire, or ALQUIERE, a Portuguese dry measure. The *A.* of Lisbon = 0·36 bushel. The *A.* of Rio Janeiro = 1 bushel.

Altimeter. See QUADRANT.

Altometer. See THEODOLITE.

Alto-Relievo, sculptured works in high relief.

Alum, [Ger. *alaun;* Du. *aluin;* Fr. *alun;* It. *allume;* Sp. *allumbre;* Lat. *alumen,*] a salt of great importance in the arts, consisting of a ternary compound of *alumina* or pure argillaceous earth, potass, and sulphuric acid. *A.* is sometimes found native; but by far the greater part of that which is met with in commerce is artificially prepared. It is brittle, colorless, inodorous, and has a sweetish astringent taste. Sp. gr. 1·73. The best *A.* is the Roman, or that which is manufactured near Civita Vecchia. It is in irregular octahedral, crystalline masses, about the size of a walnut, and is opaque, being covered on the surface with a farinaceous efflorescence. The Levant, or *Roch A.*, is in fragments about the size of the former, but in which the crystalline form is more obscure; it is externally of a dirty rose color, and internally exhibits the same tinge, but clearer. It is usually shipped from Smyrna; but it was anciently made at Roccha, or Edessa, in Syria, and hence its name Roch *A.* English *A.* is in large, irregular semi-transparent, colorless masses, having a glassy fracture, not efflorescent, and considerably harder than the others. It is very inferior to either the Ro-

man or Roch *A.* The principal use of *A.* is in the art of dyeing, as a mordant for fixing and giving permanency to colors which otherwise would not adhere at all, or but for a very short time; but it is also used for a great variety of other purposes. *Imp.* duty, 60 cts. per 100 lbs.

Alumina, is an oxide of the metal aluminium, and is the basis of nearly all sorts of clay; it occurs naturally in felspar and many other rocks, and can be obtained chemically from alum. When pure, *A.* is a white powder, soft to the touch, insipid, insoluble in water and in most acids, very hard in its small particles, so purely white as to form a good basis for paints and colors, attracts moisture strongly, becomes plastic when mixed with water (this is a characteristic of the clay series generally), gives the crimson tint to the colors called lakes, and forms a fine blue color in combination with cobalt. The gems sapphire, oriental ruby, and topaz are nearly pure *A.* in a crystalline state. In almost all clay, silica is present with *A.* in various proportions. The most useful salt of *A.* is the sulphate, for which see ALUM.

Aluminium, is a metal first isolated from aluminia, in 1845, by Wöhler. In 1854 Deville devised a mode of obtaining it sufficiently cheaply to bring it within the range of manufacturers, and other chemists have introduced improvements which gradually have lowered the price of the metal in the market, though there is little probability that it will ever be cheap. Before the improved processes were introduced, *A.* sold for as much as gold, weight for weight; from which standard the price has lessened to about $1 per oz.; but even at this last price it is nearly as dear as silver, and therefore only suited for special purposes. When prepared in any of the numerous ways now adopted, *A.* is a white metal, something like zinc in color and hardness; it is only one-fourth as heavy as silver; it is very sonorous, and seems likely to be useful for musical instruments; in elasticity and tenacity it about equals silver; it can be beaten out, either hot or cold, into leaves as thin even as $\frac{1}{10000}$; it is easily drawn out into wire; it can readily be polished by burnishing; and varied by a beautiful alternation of burnished and dead surface; it undergoes no sensible alteration in air or in oxygen, even at a high temperature. Then, again, *A.* melts at a lower temperature than silver, and is on that account preferable for some manufacturing purposes; it flows easily into moulds, whether of metal or sand; if soiled by dust, it can be cleaned with India-rubber or soap and water; if made greasy, with benzine; it can be soldered with an alloy of zinc, copper, and *A.*, having 80 or 90 per cent. of the first-named metal; it forms alloys with iron, zinc, nickel, copper, and silver. The various properties of *A.* have already brought it into use for a number of purposes. It is used for bracelets, combs, pen-holders, pins, spoons, forks, drinking-vessels, shirt-studs, statuettes, etc. Its rank may be now said to be midway between the precious and the common metals. The mutual relations of *A.* and copper give origin to a remarkable alloy. Each gives hardness to the other; and the compound, of a golden color, takes a fine polish. The nearest approach to the appearance of real gold, by a compound in which no gold exists, is made by copper alloyed by 5 or 10 per cent. of *A.*, deep and pale gold colors having their respective ratios. This alloy, under the names of *A. bronze* and *A. gold*, seems likely to have an important future before it. An alloy of 90 copper and 10 *A.* possesses remarkable malleability and strength.

Amadou. See AGARIC.

Amalgam, is a compound of mercury with some other metal. Many such *A.* may be easily formed; and they are for the most part either soft or easily crumbled. With lead, mercury forms an *A.* useful in silvering the inside of glass globes; with gold, an *A.* which assists in the process of watch-gilding or metal-gilding; with tin, an *A.* which constitutes the metallic back of a looking-glass or mirror, and also an *A.* which facilitates the deposition of a thin, brilliant coating of tin on the surface of iron, steel, and copper, called *cold tinning;* with zinc, an *A.* useful as a protection for the bottoms of iron ships; with palladium, an *A.* employed somewhat in the same way as that of zinc; with zinc and tin together, an *A.* useful for coating electric machines.

Fig. 11. — ALPACA.

Amalgamation, is strictly any mode of causing mercury to combine with other metals to form the amalgams above noticed; but technically it usually means the separation of silver or gold from the ores in which these precious metals are usually found, mercury being the agent or instrument. As regards silver, for instance: sulphuret or other ore of silver is washed, ground, mixed with common salt, roasted, ground again, and mixed with mercury and iron. Various other substances being driven off, the silver and mercury unite; and the mercury is finally driven off by distillation, leaving the silver isolated. A process nearly similar is employed for gold.

Amande, the French name for Almond; *aman-*

des cassées being shelled almonds, and *amandes en coques*, unshelled.

Amazon Stone, a crystallized variety of felspar, of a beautiful apple-green color, found in South America near the river Amazon, and in the Ural mountains.

Amber, [Ger. *Bernstein;* Du. *Barnsteen;* Fr. *ambre jaune;* It. *Ambra gialla;* Lat. *succinum electrum*,] a brittle, light, hard substance, usually nearly transparent, sometimes nearly colorless, but commonly yellow, or even deep brown. It has considerable lustre. Sp. gr. 1·065. It is found in beds of lignite, in nodules or rounded masses, varying from the size of coarse sand to that of a man's hand. It is tasteless, without smell, except when pounded or heated, when it emits a fragrant odor. It is highly electric. *A.* is undoubtedly of vegetable origin, and, as is clear from the insects, etc., often preserved in it, was originally exuded in a fluid state from some extinct species of pine. *A.* is found in various countries, more particularly on the Adriatic and Sicilian shores, and in Prussia, near the sea-coast, between Memel and Dantzic, where there are regular mines of it. In the U. States, it is found, in small quantities, principally at Amboy (New Jersey), and at Gayhead and Cape Sable (Maryland). *A.* is sometimes adulterated with copal and other resins, which are detected by their different appearance, and by not exhaling the proper odor when burned. *A.* is used for ornamental purposes in the manufacture of necklaces, mouth-pieces for cigars and smoking-pipes, etc. It is also used in the manufacture of various kinds of varnish, dissolved with drying linseed-oil, asphaltum, and resin; it is used as a coachmaker's varnish, and the spirit varnishes, which are prepared from the solution of amber in alcohol, or ether, are used for photographic purposes. The principal market for *A.* is Constantinople. The straw-yellow, slightly clouded, translucent variety is the rarest, and most esteemed by the Orientals. In other countries, the orange-yellow, transparent variety is preferred. *Imp.* (not manufactured) free. See SUCCINIC ACID.

Ambergris, [Fr. *ambregris;* Ger. *ambra;* Sp. and Port. *ambargris;* It. *ambracani,*] a substance found principally in warm climates, floating on the sea, or thrown on the shores; it is said to be a morbid product of the spermaceti whale. It is generally procured in small fragments, but sometimes in masses weighing upwards of 100 lbs. When good, it is solid, opaque, of a bright gray color, which is darkest externally, and intermixed with yellow or reddish streaks. It has a fragrant and peculiar odor when heated and rubbed. Sp. gr. about 0·914. The best comes from Madagascar, Surinam, and Java. It is used as a perfume, and possesses the remarkable power of increasing the odor of other perfumes. It usually sells in New York at about $20 per oz. This high price leads to frequent adulteration of the commodity. *Imp.* free.

Amboyna. See MOLUCCAS.

Amboyna, or LINGOA WOOD, a fancy wood of various colors, and having the shades generally small. It is much used in cabinet-work, and is imported from Ceram and Amboyna, in logs of about 2 feet wide.

Ambrette, a French name for musk seed.

Ambulance, a travelling medical carriage for transporting invalids or wounded persons.

American Leather, a kind of varnished or enamelled cloth, prepared in imitation of leather for covering chairs, sofas, writing-tables, etc. It is chiefly manufactured in Newark, New Jersey.

American Red-Root, is the *Ceanothus Americanus.* The root is used to dye wood a cinnamon color, and the leaves are known as New Jersey tea.

American Tea, the leaves of a species of Camellia, which grows on the Bald Eagle mountain, in Pennsylvania.

Amethyst, [Fr. *amethyste;* Ger. *amethyst;* It. *amatista;* Sp. and Port. *ametisto,*] a precious stone of a purplish-violet color and great brilliancy. It is of two kinds, the *oriental* and *common.* Of these, the oriental, which is a species of sapphire, is by far the most valuable. The common or occidental *A.* is merely a colored variety of quartz, or rock crystal, and is in beauty, lustre, and hardness, much inferior to the oriental *A.* It occurs crystallized, in rounded pieces, and in massive portions; but its primary form, like that of quartz, is a slightly obtuse rhomboid. It is most valuable when large, high colored, and without flaws. It is found in India, Germany, Sweden, and Spain, but is chiefly imported into this country from Brazil. *Imp.* duty (unset) 10 per cent., (set) 25 per cent. See SAPPHIRE.

Amianthus. See ASBESTOS.

Amidon, the French name for starch.

Ammonia, *Volatile Alkali*, or *Spirits of Hartshorn*, a pungent volatile substance, of great importance and extensive use, which is formed during the putrefactive fermentation of animal matter. When pure, it is a gaseous body, composed of 3 equivalents of hydrogen and 1 of nitrogen; sp. gr. 0·590; but in medicine and the arts, it is generally used in solution in water, or in combination with other substances. *Imp.* duty, 20 per cent.—*Liquid A.* or *Hartshorn*, is an aqueous solution of *A.*, prepared either by pressing the gas as it is found directly into water, or by distillation from sal-ammoniac, burnt-bone, and water. In the former case the sp. gr. is 0·880, in the latter 0·954. It is limpid, colorless, very volatile, has a pungent smell and a caustic taste; and is one of the most useful stimulants. *Imp.* duty (as medicine), 40 per cent.; (crude, or gum ammonia) free.—*Acetate of A.*, or *Spirit of Mindereus*, is prepared by adding sesqui-carbonate of *A.* to dilute acetic acid. It has a sweetish bitter taste, and is employed externally as a refrigerant, and internally as a diaphoretic. *Imp.* duty, 25 cts. per lb.—*Carbonates of A.* The *Carbonate of A.* may be obtained by uniting 1 vol. of carbonic acid gas with 2 vols. of ammonial gas. It is a dry, white, volatile powder, and is used as a stimulant in a preparation called *Spirit of Sal Volatile.* The *Sesqui-carbonate of A.* is obtained by sublimation from a mixture of hydrochlorate or sulphate of *A.* and chalk, and usually occurs in cakes, broken out of the subliming vessel. When fresh, it is of a crystalline texture, semi-transparent, and hard, odor pungent, and taste penetrating. It is extensively used in chemical preparation. In medicine it is employed as a stimulant, and is usually called *smelling-salts.* It is also used instead of yeast, in making some kinds of bread. *Imp.* duty, 20 per cent.—*Hydrochlorate* (*Mdriate*) *of A.*, or *Sal-ammoniac*, [Fr. *sel ammoniac;* Ger. *salmiak,*] was originally procured from Egypt, where it was made from the soot of camel's dung. It is now, however, prepared in abundance in this country, by decomposition of the ammoniacal fluid given off during the prepara-

tion of coal-gas; also, by a complicated process, from bones and other refuse of animal substances containing its ingredients. It is likewise found native at Etna and Vesuvius, in some of the Tuscan lakes, in Persia, etc. As generally obtained, it is in large cakes of a semi-circular form, translucent and colorless, with a sharp saline taste, but no smell. Sal-ammoniac is extensively employed in the arts. It is used in preparing aqua regia, in soldering some of the metals, in tinning iron and copper, in the preparation of dyes, etc., also in various chemical manufactures. *Imp.* duty, 10 per cent.

Ammoniacum, or *Gum Ammoniac*, [Fr. *Gomme Ammoniaque;* Ger. *Ammoniak*,] a gum resin, procured, according to some authorities, from the plant *Heracleum gummiferum*, but by others referred to the *Ferula Orientalis*. It has rather a heavy smell, and a bitter-sweet taste. It is in agglutinated masses of *tears*, or in separate dry drops, of a yellowish-white color. Sp. gr. 1·207. That which is decidedly guttiform, of a clear and deep buff color externally, pale within, and free from impurities, is most esteemed. It is produced in Persia, Abyssinia, and other places, but is imported into this country from England. It is used in medicine as a stimulant; and in the arts, to form the *diamond cement* employed to join pieces of broken glass or porcelain. *Imp.* free.

Ammunition, a general term in commerce for certain military stores, such as powder, shot, artillery and small-arm projectiles with their cartridges and the percussion-caps, friction-primers, etc., by means of which they are fired; also war-rockets and hand-grenades. For artillery, when the projectiles, their cartridges, primers, etc., are packed in the same box, it is designated in the U. States service as *fixed ammunition;* this is the description furnished for field and siege artillery. *A.* for small-arms is known in the U. States service as *small-arm cartridges*. In these the bullet and cartridge are invariably put up together in boxes of 1,000, except some descriptions of patented cartridges, which are put up in boxes containing 600 or 1,200, and repeating-cartridges, in which the box is made to contain a multiple of the number which fills the breech-chamber.—*Knight.*

Amontillado, a dry kind of sherry of a light color, much used to reduce the color of other sherries when too high.

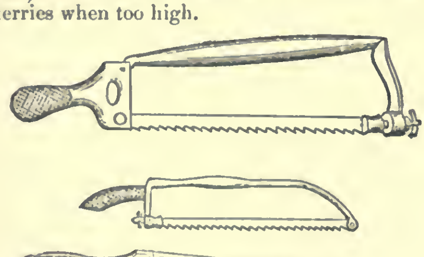


Fig. 12.—Amputating Saws.
(Copied from Knight's .)

Amortization, the redemption by a sinking-fund.

Amoy. See China.

Amputating Knife and Saw. The *A.* knife, used for making the incisions in amputations, has a long, narrow blade. The *A.* saws, which are of sizes from 4 to 14 inches in length, are modifications of the *tenon*, *frame*, joint, and crown saws (see Fig. 12). The Hey's saws, used in making ensections, and in removing carious bones from deep-seated places, have edges more or less curved, and the smallest of these dwindle down to a nearly circular plate of steel less than an inch in diameter, serrated round the edge, except where a slender shank terminating in a wooden handle is riveted to the edge of the saw-plate.—*Knight.*

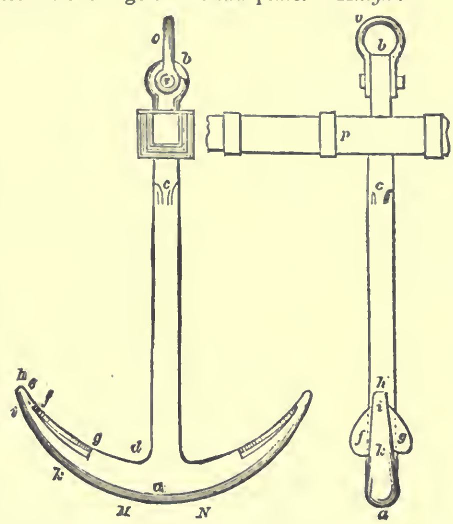


Fig. 13.—Anchor.
a to *b*, shank; *b* to *c*, square; *d* to *e*, arm; *f* to *g*, palm, fluke, or kevel; *h* to *i*, point, pee, or bill; *i* to *k*, blade; *M* to *N*, crown; *o*, ring; *p*, stock; *d*, throat or crutch.

Amsterdam. See Holland.

Amulets, are articles of various kinds, sold as imaginary charms, to ward off evil from the wearer.

Ana, an East Indian name for the 16th part of anything, as the link of a measuring chain; the 16th of the qonta, a land measure, or 7½ sq. yards.

Anacahuite-Wood, the wood of a Mexican tree, *Cordia boisseri*, introduced into commerce as a reputed remedy for consumption.

Anæsthetic Apparatus. See Inhalers.

Anastatic Printing, a mode of reproducing engravings and printed matter by saturating the print or drawing with an acid; it is then transferred on a plate of metal, from which copies are printed in a manner similar to lithography.

Anatto, same as Annotto, q. v.

Anchois, the French spelling for anchovy and anchovies.

Anchor, [Fr. *ancre;* Ger. *anker;* It. *ancora;* Sp. *ancla*,] a heavy hooked iron instrument for fixing a vessel in a harbor or road. Large ships carry 4 principal *A.*, the *sheet*, *best bower*, *small bower*, and *spare A.;* and two small ones besides, for particular purposes, namely, the *stream* and *kedge*. The weight of the largest *A.* is about 1 cwt. for each twenty tons measurement, or 0·0025 of the tonnage of the vessel. An *A.* (Fig. 13) consists of two arms terminating in broad expansions termed flukes, and attached to a long shank, to which is fixed a stock of wood or iron at right angles to the arms, to insure the perpendicularity

of the flukes when the *A.* is on the bottom, in order that they may take firm hold of the ground. *A.* require to be made of the very best and toughest wrought-iron. They are made by welding together a fagot of bars under a steam- or trip-hammer, the smaller and more difficult portions being shaped and rounded off, and the whole *A.* finished up by hand. The form of the *A.* remained almost unchanged from a very early period until the second part of this century, when more complex methods of fabricating have been partially introduced; but an *A.* differing little from the old-fashioned type, excepting that even the very largest sizes have iron hooks, is still in use in the navy and merchant service of the U. States. Small *A.*, termed *grapnels*, and having 4 or more arms, are used for boats. The *mushroom A.*, so called from its shape, is much employed in the

Fig. 14. — ANGELICA.

East Indies by the native vessels called grabs. — *A.* are manuf. in Pennsylvania, Maryland, and other places in the U. States; they are also imported from England. When imported to be used for the equipment of a vessel, they are liable to duty. *Imp.* duty, 2½ cts. per lb.

Anchorage, a duty paid for the liberty of anchoring in a port. It means also a ship's anchoring ground.

Anchovy, [Fr. *anchois;* It. *acciuga,*] is a small fish (*Engraulus encrasicholus*), about the size of the finger, of a bluish-brown color on the back, and silvery white on the belly. It abounds in the Mediterranean, particularly off Gorgona, near Leghorn, where it is taken in May, June, and July. It is also found on the coasts of France and Portugal. After being caught, and the heads and entrails separated, the bodies are salted and packed in small barrels, in which, if the air is excluded, they will keep for a considerable time. Genuine anchovies are small and firm, round-backed, fibre red, with skin of a silvery white. Those that are dark-brown without, with flabby, pale-colored flesh, and tapering much towards the tail, are commonly *sardines*, an inferior species, frequently substituted for, or mixed with, the true kind. They are prepared as a delicacy, and are used in the manufacture of *A. sauce.* They are mostly imported into this country from Italy.

Customary tare, in barrels of 16 lbs., 6 lbs. each. *Imp. duty* (preserved in oil, or otherwise), 50 per cent.

Andazé, a Turkish cloth measure = 27 inches.

Anderson, Lebanon, and St. Louis R.R., (in progress,) to run from Anderson to Montezuma, Ind., 100 m. Office at Anderson. *Financial Statement* 31 Dec., 1877: Cap. stock authorized, $2,000,000; paid in, $1,000,000. Funded debt authorized, 1st mortgage bonds dated 1 Nov., 1875, bearing 7 % interest, payable May and Nov., principal payable 1905, at the rate of $15,000 per mile. Cost of construction to date, $1,000,000; estimated cost to completion, $2,500,000.

Anemometer, [from Gr. *anemos*, wind; *metreo*, to measure,] an instrument or machine to measure the wind, its *direction* and *force*. Three descriptions of *A.* are usually employed — 1. Dr. Whewell's; 2. Mr. Follett Osler's; 3. Dr. Robinson's.

Anemoscope, a weather-vane and register to indicate the changes of the wind and weather.

Angelica, [Fr. *angélique;* Ger. *angelika,*] a large umbelliferous plant (*Angelica archangelica*), cultivated in gardens, all parts of which have a fragrant, aromatic smell, and a pleasant bitter taste (Fig. 14). The tender stems, stalks, and the midribs of the leaves are made, with sugar, into a sweetmeat (candied *A.*). The dried *A.* root is imported, free from duty, from Hamburg in casks, and is used by rectifiers and compounders in the preparation of gin, and as an aromatic flavoring for "bitters."

Angle-Bars, pieces of iron for forming the edges of iron safes, bridges, and ships, or to be riveted to the corners of iron boilers, tanks, etc., to connect the side plates.

Angola, a light and fashionable cloth, made from the Angora goat's wool, which is also made into plush, and from its repelling heat is used for cloaks and overcoats.

Angora Wool, is the long, silky hair of a breed of goats raised in large numbers at Angora in Asiatic Turkey, and successfully introduced into the U. States. Large quantities of this hair are exported from Smyrna and Constantinople, and manufactured into shawls, camlets, and fine cloth, etc. In France, this article is also now applied to the manufacture of a new kind of lace, which is more brilliant than that made from silk, and which in a great measure supersedes the costly fabrics of Valenciennes and Chantilly. See ANGOLA and MOHAIR.

Angostura, or CUSPARIA BARK, is a valuable tonic, obtained from the stem and branches of a

species of *Galipea*, the former being in flat and the latter in quilled pieces. It breaks with a short and resinous fracture, is covered with an ash-colored epidermis, is internally smooth, and of a dull brownish-yellow color. Its odor is rather nauseous and fishy, and it has a strong, bitter flavor, accompanied by a peculiar and somewhat aromatic pungency. It is found in the warmer parts of South America, especially in the neighborhood of Angostura, in Venezuela. *Imp.* free.

A spurious and poisonous bark is sometimes met with under the name of *A.* This is more intensely bitter, and in shorter and less regular pieces than the genuine; internally, it is nearly black, and externally, covered with a rough, rust-colored epidermis.

Angostura Bitters. See BITTERS.

Anil, the Spanish name for Indigo.

Anileine. See ANILINE VIOLET.

Aniline, [Fr.; Ger. *Das Anilin*,] is a colorless, oily, and highly poisonous liquid, having a faint vinous odor, and an aromatic burning taste. Sp. gr. 1·002. It dissolves in all proportions in ether, alcohol, and in fixed and volatile oils. When exposed to the air, it acquires a yellow or red color, which is always noticed in commercial aniline oil. It forms a numerous class of salts, most of which crystallize readily. It was discovered in 1826 by Unverdorben, as a product of the distillation of indigo, and was named from Anil, the name of the American species of the indigo plant (*Indigofera*). It is generally obtained from the basic oil of coal-tar. The beautiful blue color which it strikes with a solution of bleaching powder is sufficient for its recognition. It has met with an important application in the arts, in the production of beautiful dye colors, which are very intense, a few pounds' weight of the dye being capable of coloring some miles of fabric. *A.* colors are used for the production of brilliant tints on cotton, wool, and silk; also for ink, for coloring leather, soaps, candles, ivory, horn, etc. Their high cost is counterbalanced by the brilliancy of their tints and the simplicity of dyeing. Unfortunately, the speedy alteration by light of nearly all the *A.* colors will probably check their use in art.

A. Black, is obtained by dissolving a salt of *A.* in water, then adding chlorate of potash and sulphide of copper, or sulphate of iron. This color, however, can scarcely be said to have been satisfactorily produced. All the *A.* blacks are liable to turn green by exposure.

A. Blue and *Green.* The coloring-matter known as *Bleu de Paris* and *Bleu de Lyon* is obtained by heating a salt of rosaniline for several hours with an excess of *A.* The beautiful indigo-blue color *Azurine* is produced by the mixture of *A.* with chlorate of potassium, to which a quantity of hydrochloric acid has been added. This and other *A.* blues possess the property of acquiring, under the influence of acids, a green tint called *Emeraldine.*

A. Red. This color, discovered by Dr. Hoffman in 1858, is generally produced by the combination of arsenic acid with a slight excess of *A.* New processes, however, have been introduced for the production of *A.* reds without the use of arsenic. All the red derivatives of *A.* are composed essentially of rosaniline salts (see ROSANILINE). The red known as *fuchsine*, consists chiefly of hydrochlorate of rosaniline. The *Azaléine*, or *A.* red prepared by nitric acid, is principally nitrate of rosaniline. The salts of rosaniline, which are chiefly employed for dyeing silk and wool, are the acetate, the hydrochlorate, and the nitrate, and their application is simple in the extreme. The silk is dyed by passing it through a cold aqueous solution of the salt: for the dyeing of the wool the solution is heated to 50° or 60°. Rosaniline is fixed by silk and wool with so great force and rapidity, that it is necessary in dyeing to take particular precaution, and to operate with solutions that are at first comparatively weak, and are only gradually strengthened, to prevent the dyeing being unequal, and the portion first immersed in the bath being more strongly colored than those afterwards introduced. Cotton, at the contrary, does not prevent any attraction for *A.* colors generally. Their fixation on cotton can, therefore, only be effected by first heating the cotton with some animal mordant, or with tannic acid.

A. Violet. The names of *Anileine, Indisine, Mauve, Phenameine, Rosolane, Tyroline, Violet Imperial, Violine*, etc, have been given to the varieties of this color, which was first obtained in the crystalline condition in 1860 by M. Scheurer-Kestner. *A.* violet resists the action of light to a very considerable extent, though inferior in this respect to either madder, cochineal, or indigo. To dye silk, an alcoholic solution of the violet purple is diluted with eight times its volume of hot water previously acidulated with tartaric acid. This liquid is poured into the dyeing-bath of cold water slightly acidulated. Through this the silk is passed until the required shade is obtained. The dyeing of wool is conducted at a temperature of 50° to 60° C., the dye-bath consisting simply of a dilute aqueous solution of coloring-matter, without any acid.

A. Yellow, or *Chrysaniline*, is obtained by submitting for some time the residue from which the *A.* red (rosaniline) has been extracted to a current of steam, when a quantity of the base passes into solution. Addition of nitric acid to this solution precipitates the chrysaniline in the form of a difficultly soluble nitrate. Chrysaniline and its salts dye silks and wools a splendid golden-yellow color.

Animal Charcoal, principally carbonized bone, used by sugar-refiners and by iron-makers in blistering steel. When obtained cheap, it forms a valuable fertilizer for land. *Imp.* free.

Animal Fat, is the name given in commerce principally to tallow and lard; but the name is also applied to horse grease, bear's grease, and blubber.

Animal Jelly. See GELATINE.

Animal Manures. See MANURES.

Animé, or ANIMI, is a resin of a brown yellow color, transparent and brittle. It exudes from the Courbaril, a large South American tree which is a species of *hymenæa.* It occurs in pieces of various sizes, and it often contains so many insects belonging to living species, as to have merited its name, as being animated. It contains about a fifth of 1 per cent. of a volatile oil, which gives it an agreeable odor. Sp. gr. 1·054 to 1·057. It is extensively used by varnish-makers, who fuse it at a pretty high heat, and in this state combine it with their oils or other varnishes. It is also employed, on account of its agreeable smell when burning, in the manufacture of pastilles. *Imp.* free.

Aniseed, [Fr. and Ger. *anis*,] is the fruit or seed of an umbelliferous plant (*Pimpinella anisum*) largely cultivated in Malta, Spain, and Germany (Fig. 15). It has an aromatic smell and a warm sweetish taste. The small compact seed imported from Spain is usually preferred to the lighter and larger kind, which is the growth of Germany and England. It is used in medicine and confectionery.

Oil of A., is a volatile fluid obtained from the seeds by distillation; it concretes at about 35·6 F., which is its leading character. It is used in cordials, and from it are prepared the spirit of anise (*spiritus anisi*) and anise water (*aqua anisi*). The *oleum badiani*, or the *oil of star anise* (*illicium anisatum*), has the color and taste of the oil of anise; but it preserves its fluidity at 35·6. It is sometimes fraudulently substituted for *oleum anisi.*

Anisette, a French liquor obtained by distilling aniseed, fennel, and coriander-seed with brandy, and sweetening the product. The *A. de Bordeaux*, when genuine, is a delicious and very stomachic drink. *Imp.* $2 per gal.

Anker, a liquid measure in various places. The English *A.* contains 10 wine galls., or 8⅓ imp. galls. The Scottish *A.* of 20 Scottish pints equals about 7½ imp. galls. In Copenhagen the *A.* contains about 8¼ imp. galls.; in Amsterdam, Riga, and Pernau, 8½; in Revel, 9¼; and in Rostock, nearly 8 imp. galls.

Anna. Same as **Ana** (q. v.).

Annealing, [Fr. *le recuit*; Ger. *das anlassen*,] is a process by which glass is rendered less fran-

gible; and metals which have become brittle, either in consequence of fusion or long-continued hammering, are again rendered malleable. When a glass vessel is allowed to cool immediately after being made, it will, if a small splinter of flint, or an angular fragment of quartz, be dropped gently into it, make it fly to pieces with great violence. This extreme fragility is prevented by *A.*, or placing the vessels in a hot oven, when they take several hours, or even some days, to cool. When metals have been extended to a certain degree under the hammer, they become brittle, and incapable of being farther extended without cracking. In this case the workman restores their malleability, sometimes by *A.*, or, in other cases, by heating them red-hot, and allowing them to cool slowly. Cast-iron is now rendered malleable without subjecting it to the action of puddling. The process is somewhat similar to that employed in annealing glass. The metal is kept imbedded in ground charcoal for several hours at a high temperature, and then allowed to cool slowly. In this manner vessels are made of cast-iron which

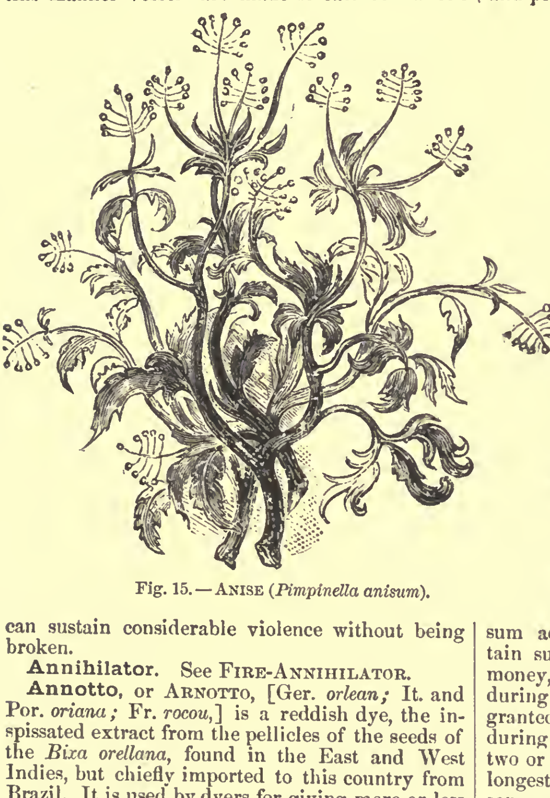


Fig. 15.—ANISE (*Pimpinella anisum*).

can sustain considerable violence without being broken.

Annihilator. See FIRE-ANNIHILATOR.

Annotto, or ARNOTTO, [Ger. *orlean;* It. and Por. *oriana;* Fr. *rocou,*] is a reddish dye, the inspissated extract from the pellicles of the seeds of the *Bixa orellana*, found in the East and West Indies, but chiefly imported to this country from Brazil. It is used by dyers for giving more or less of an orange cast to the simple yellows, as an ingredient in varnishes, and for coloring cheese and butter. *A.* is moderately hard, of a brown color on the outside and a dull red within. There are two kinds. *Flag* or *cake A.*, in cakes of 2 or 3 lbs. weight each, is generally enveloped in large flag-leaves. *Roll A.*, a more concentrated extract, is brought in small rolls of a few ozs. weight, and contains a larger proportion of coloring matter than the former. This is the kind used chiefly in dairies. It is often adulterated with wheat or rye-flour, salt, and soap, for weight; and turmeric or ferruginous earth, for color. *Imp.* free.

Annuity, is a periodical payment of money, amounting to a certain annual sum, and continuing either a certain number of years, as 10, 20, or 100, or for an uncertain period, to be determined by a particular event, as the death of the annuitant, or that of the party liable to pay the *A.*, or of some other person, or indefinitely; and these last are called *perpetual* annuities. When the possession of an *A.* is not to be entered upon until the expiration of a certain period, it is called a *reversionary*, or *deferred A.* When an *A.* is dependent upon the existence of a life or lives, it is called *life A.* As an *A.* is usually raised by the present payment of a certain sum, as a consideration whereby the party making the payment, or some other person named by him, becomes entitled to an annual, semi-annual, quarterly, or other periodical payment of a certain sum, for a stipulated number of years, or for a period to be determined by the happening of a certain event. The rules and principles by which this present value is to be computed have been the subject of much scientific investigation. The present value of a perpetual *A.* is evidently a sum of money that will yield an interest equal to the *A.*, and payable at the same periods. The present value of an *A.*, for a limited period, is a sum which, if put at interest, will, at the end of that period, give an amount equal to the sum of all the payments of the *A.* and interest; and, accordingly, if it be proposed to invest a certain sum of money in the purchase of an *A.*, for a given number of years, the comparative value of the two may be precisely estimated, the rate of interest being given. But annuities for uncertain periods, and particularly life annuities, are more frequent, and the value of the *A.* is computed according to the probable duration of the life by which it is limited. Many such annuities are granted for public services by acts of Congress of the U. States, and, as these do not arise from a specific contract, and are not usually subjects of purchase, their precise value is not often a subject of investigation. But life annuities are often created by contract, whereby a private party — more usually a life insurance company — agrees, for a certain sum advanced by the purchaser, to pay a certain sum annually to the person advancing the money, or some other annuitants named by him, during the life of the annuitant; or the *A.* is granted to the annuitant, his heirs and assigns, during the life of some other person, or during two or more joint lives, or during the life of the longest liver or survivor among a number of persons named in the agreement whereby the *A.* is raised. Such annuities are usually made transferable, and are sold and purchased in the market as a species of public stocks.—When an *A.* is created by a contract with a private party or company, its object usually is to give the use, during his life, not only of the income of his capital, but of the capital itself. If a person, having a certain capital, and intending to spend this capital and the income of it during his own life, and leave no part to his heirs, could know precisely how long he should live, he might loan this capital at a cer-

tain rate during his life, and, by taking every year, besides the interest, a certain amount of the capital, he might secure the same annual amount for his support during his life, in such manner that he should have the same sum to spend every year, and consume precisely his whole capital during his life. But, since he does not know how long he has to live, he agrees with a party or company to take the risk of the duration of his life, and to pay him a certain *A.* during his life, in exchange for the capital which he proposes to invest in this way. The probable duration of his life, therefore, becomes a subject of computation; and, for the purpose of making this calculation, tables of longevity are made, by noting the proportions of deaths, at certain ages, in the same country or district. See INTEREST, LIFE INSURANCE, and MORTALITY (tables of).

The following tables show the cost of an *A.* of $100, and the amount of *A.* which a deposit of $1000 will purchase in the best life insurance companies of New York, the rates charged by them being usually those found in the columns marked five per cent.

Annuity produced by a Deposit of One Thousand Dollars at the Age stated.

Age.	Four and a half per Cent.	Five per Cent.	Six per Cent.
	$ Cts.	$ Cts.	$ Cts.
10	56 00	60 50	69 70
11	56 30	60 80	69 90
12	56 60	61 10	70 20
13	56 90	61 40	70 50
14	57 30	61 70	70 80
15	57 60	62 00	71 20
16	58 00	62 40	71 50
17	58 30	62 80	71 80
18	58 70	63 10	72 20
19	59 10	63 50	72 50
20	59 50	63 90	72 90
21	59 90	64 30	73 30
22	60 40	64 70	73 70
23	60 80	65 20	74 10
24	61 30	65 60	74 60
25	61 80	66 10	75 00
26	62 30	66 60	75 50
27	62 80	67 10	76 00
28	63 40	67 70	76 50
29	63 90	68 20	77 10
30	64 50	68 80	77 60
31	65 10	69 40	78 20
32	65 80	70 00	78 80
33	66 50	70 70	79 50
34	67 20	71 50	80 20
35	67 90	72 20	80 90
36	68 70	73 00	81 60
37	69 60	73 80	82 40
38	70 40	74 60	83 30
39	71 30	75 50	84 10
40	72 30	76 50	85 10
41	73 30	77 50	86 10
42	74 40	78 60	87 10
43	75 60	79 70	88 20
44	76 80	80 90	89 40
45	78 10	82 20	90 70
46	79 40	83 60	92 10
47	80 90	85 00	93 50
48	82 50	86 60	95 00
49	84 10	88 20	96 70
50	85 80	90 00	98 40
51	87 70	91 80	100 20
52	89 70	93 80	102 20
53	91 80	95 90	104 30
54	94 00	98 10	106 60
55	96 40	100 50	109 00
56	99 00	103 10	111 50
57	101 70	105 90	114 30
58	104 70	108 80	117 30
59	107 80	112 00	120 50
60	111 20	115 40	123 90
61	114 90	119 10	127 60
62	118 80	123 00	131 50
63	123 00	127 20	135 80
64	127 50	131 70	140 40
65	132 30	136 60	145 30
66	137 50	141 80	150 60
67	143 10	147 50	156 20
68	149 10	153 50	162 30
69	155 60	160 00	168 90
70	162 70	167 10	176 10
71	170 40	174 90	183 90
72	178 70	183 20	192 40
73	187 70	192 30	201 50
74	197 50	202 10	211 50
75	208 10	212 80	222 30

Sum required to Purchase, at the respective Ages mentioned, an Annuity of One Hundred Dollars.

Age.	Four and a half per Cent.	Five per Cent.	Six per Cent.
	$ Cts.	$ Cts.	$ Cts.
10	1786 46	1653 76	1435 52
11	1776 73	1645 63	1429 69
12	1766 85	1637 38	1423 78
13	1756 79	1628 90	1417 73
14	1746 55	1620 38	1411 56
15	1736 11	1611 62	1405 24
16	1725 46	1602 67	1398 77
17	1714 60	1593 53	1392 15
18	1703 51	1584 19	1385 36
19	1692 20	1574 63	1378 40
20	1680 64	1564 86	1371 26
21	1668 82	1554 85	1363 93
22	1656 76	1544 62	1356 41
23	1644 45	1534 15	1348 70
24	1631 84	1523 41	1340 77
25	1618 96	1512 41	1332 62
26	1605 76	1501 13	1324 22
27	1592 26	1489 56	1315 58
28	1578 43	1477 69	1306 69
29	1564 27	1465 50	1297 53
30	1549 78	1453 01	1288 09
31	1534 93	1440 18	1278 38
32	1519 71	1426 99	1268 35
33	1504 12	1413 46	1258 01
34	1488 13	1399 54	1247 34
35	1471 72	1385 23	1236 32
36	1454 80	1370 52	1224 93
37	1437 60	1355 36	1213 15
38	1419 85	1339 76	1200 97
39	1401 61	1323 69	1183 60
40	1382 86	1307 12	1175 29
41	1363 59	1290 05	1161 76
42	1343 78	1272 45	1147 74
43	1323 41	1254 30	1133 20
44	1302 45	1235 58	1118 12
45	1280 92	1216 28	1102 50
46	1258 77	1196 39	1086 30
47	1236 04	1175 90	1069 63
48	1212 80	1154 90	1052 26
49	1189 09	1133 42	1034 50
50	1164 92	1111 47	1016 27
51	1140 30	1089 06	997 56
52	1115 24	1066 18	978 38
53	1089 71	1042 82	958 69
54	1063 74	1018 99	938 52
55	1037 30	994 67	917 82
56	1010 41	969 87	896 62
57	983 11	944 62	874 92
58	955 42	918 96	852 76
59	927 39	892 91	830 15
60	899 07	866 52	807 16
61	870 53	839 87	783 82
62	841 85	813 03	760 21
63	813 09	786 05	736 38
64	784 33	759 01	712 39
65	755 65	731 99	688 32
66	727 07	705 01	664 19
67	698 67	678 14	640 07
68	670 47	651 41	615 98
69	642 47	624 81	591 92
70	614 63	598 31	567 86
71	586 88	571 85	543 72
72	559 58	545 76	519 84
73	532 72	520 05	496 23
74	506 34	494 75	472 91
75	480 47	469 90	449 93

Annul, to cancel, or render void, as an agreement, proposition, or entry.

Annunciator. See ELECTRIC BELLS.

Anodynes, are medicines which relieve pain and procure sleep, such as opium, morphine, the anæsthetics, etc.

Anthal, a Hungarian wine measure = $11\frac{1}{8}$ imp. gallon.

Anthracite, is an important fossil fuel, the hardest variety of stone coal, consisting, when pure, almost exclusively of carbon. It has a conchoidal fracture, a black color, and an imperfectly metallic lustre, from which it is sometimes called *glance coal*. It burns slowly, with intense heat, without smoke, and with little flame. *A.* is formed from softer and more bituminous coals by the action of subterranean heat, which has driven off most of their volatile matter. The composition of *A.* is the same as that of coke formed artificially from bituminous coal, and it is more dense than coke only because it has been heated under greater pressure. The coal of the Lehigh basin is most baked, and contains the least amount of volatile matter — 3 to 7 per cent.; the Scranton coal, from 9 to 12 per cent.; the semi-bituminous coal of Blossburg and Broad Top, from 17 to 25 per cent.; the bituminous coal of Western Penn., from 30 to 50 per cent. In Rhode Island, a small basin of carboniferous rocks has been still more thoroughly calcined, and the coal is partially converted into graphite (graphitic *A.*). The density and great heating of *A.* make it the best of all fuels for metallurgic purposes, while its freedom from smoke specially commends it for combustion in cities. For the generation of steam, *A.* has no superiority over the best bituminous and semi-bituminous coals; and as a household fuel, cannel is preferred for open fires for its cheerful flame and the facility with which it is kindled; but the steadiness, cleanliness, and economy of an *A.* fire will always make it the staple fuel of communities which can obtain it.

A. occurs and is largely mined in Wales, Ireland, and other parts of Europe, but the most extensive and productive beds of *A.* are those of Penn. These form several attached basins lying between the folds of the Allegheny Mountains. Their aggregate area is only about 500 sq. m., but from their proximity to the chief centres of population and manufacture, they have had a most important effect on the development of the industry and wealth of America. — *Am. Ency.*

Antiar, a poison obtained in Java from the acrid juice of the upas-tree, *Antiaris toxicaria*.

Antigua. See WEST INDIES.

Anti-Macassar, an open-worked napkin or loose fancy covering, to preserve a chair or couch.

Antimonial Wine, a medical preparation of tartar-emetic.

Antimony, [Fr. *antimoine;* Ger. *spiesglanz;* Mal. *soormah*,] a metal extensively used in medicine; and in the arts employed in the composition of printing-types, music-plates, etc. The metallic ore of commerce consists of sulphur and other impurities combined with the pure metal. This ore is found abundantly at Rosenau, in Hungary, and in other parts of Europe, but is imported into this country chiefly from the Malayan Archipelago. It is generally of a lead-gray color, possessing considerable splendor, and is met with compact,— in acicular crystals,— and in rhombic prisms of considerable size, and variously modified. *Crude A.* is the name given in commerce to the sulphuret of the metal, after being separated from the impurities of the ore, by fusion and a species of filtration. It is usually in the form of loaves, of a dark-gray color, the goodness of which is estimated from their compactness and weight, the largeness and distinctness of the striæ, and from their being entirely vaporizable by heat. *Regulus* of *A.*, the pure metal after being separated from the sulphur, is commonly of a dusky-white color, very brittle, and of a scaly texture. Sp. gr. about 6·8. *Imp.* duty, 10 per cent.

Antimony Yellow, a preparation of antimony of a durable color, used in enamel and porcelain painting.

Antiquarian, a large kind of drawing-paper, measuring 56 by 58 inches.

Antiques. See VIRTU.

Antiseptic, any substance which prevents decomposition, as glycerine, charcoal, chloride of lime, etc.

Antwerp. See BELGIUM.

Anvil, as one of the requisites of the smithy, is in itself nothing more than a piece of iron, fitted to receive heavy blows without being either broken or dislodged. Practically, it exhibits very varied forms. Some are made of cast-iron, subject to a few finishing processes. Others are made of wrought-iron, several pieces being welded together at a white heat, and forged into form by blows from sledge-hammers. The best are faced with steel, hammered or welded when the steel is not quite so highly heated as the iron. The protuberant pieces of an *A.*— the chisel-socket, the beak or conical end, etc. — are usually welded on. Small *A.*, for delicate works, are polished with emery and crocus. *A.* are placed sometimes upon solid timber, sometimes embedded in stone. Those underneath steam-hammers are placed upon huge masses of foundation of enormous strength, otherwise the machine would soon beat itself into disorder. A steam-hammer at the Essen steel-works, in Prussia, works upon an *A.* weighing 105 tons. *A.*, ranging in weight from 28 lbs. to 6 cwt., are extensively manuf. in Pennsylvania, New Jersey, Massachusetts, Connecticut, and other parts of the U. States. They are, however, still largely imported from England, where the principal manuf. are at Birmingham, Dudley, and Sheffield. *Imp.* duty, 2½ cts. per lb.

Apiary, a place for keeping bees.

Apothecaries' Weight, the weight by which drugs are dispensed, differing only from the common troy weight in its subdivision. The ounce is divided into 8 drachms, 24 scruples, or 480 grains.

Apparel, in the official returns of imports numerous small articles of dress are grouped under this name; but in trade the term is usually applied to ready-made clothing and millinery. *A.* is also the name frequently given to the furniture of a ship, consisting of the sails, rigging, anchors, etc.

Apple, a well-known fruit, the numerous varieties of which are obtained by grafting on the *Pyrus malus*. About 1,000 varieties are cultivated in the U. States, and form an important article of commerce. In 1878, the exports of green or ripe *A.*, chiefly to England and Canada, amounted to 279,447 bushels, valued at $386,261, and the exports of dried *A.*, chiefly to Germany and Canada, amounted to 4,188,173 lbs., valued at $260,085.

Apple-Brandy, APPLE-JACK, APPLE-WHISKEY, a liquid distilled from cider.

Appliqué Lace, a name given to lace when the patterns have been cut out and sewn on a foundation of net; by this means the same patterns may be transferred from a veil to a scarf or lappet, and they will wear out several foundations.

Appraisement, or APPRAISAL, is the term applied to the valuation of foreign merchandise on

its arrival at any port in the U. States, by custom-house officers called appraisers.

Regulations.— 1. No merchandise liable to be inspected or appraised is delivered from the custody of the officers of the customs, until the same has been inspected or appraised, or until the packages are found correctly and fairly invoiced and put up, and so reported to the collector. The collector may, however, at the request of the owner, importer, consignee, or agent, take bonds, with approved security, in double the estimated value of such merchandise, conditioned that it shall be delivered to the order of the collector, at any time within ten days after the package sent to the public stores has been appraised, and reported to the collector. If, in the meantime, any package is opened, without the consent of the collector or surveyor given in writing, or if the package is not delivered to the order of the collector, according to the condition of the bond, the bond is, in either case, forfeited.

2. The collector designates on the invoice at least one package of every invoice, and one package at least of every ten packages of merchandise, to be opened, examined, and appraised, and orders the package so designated to the public stores for examination; and if any package is found by the appraisers to contain any article not specified in the invoice, and a majority of them is of opinion that such article was omitted in the invoice with fraudulent intent on the part of the shipper, owner, or agent, the contents of the entire package in which the article may be is liable to seizure and forfeiture, on conviction thereof before any court of competent jurisdiction; but if the appraisers are of opinion that no such fraudulent intent existed, then the value of such article is added to the entry, and the duties thereon paid accordingly, and the same is delivered to the importer, agent, or consignee.

3. It is the duty of every appraiser of the U. States, by all reasonable ways and means in his power, to ascertain, estimate, and appraise the true and actual market-value and wholesale price, any invoice or affidavit thereto to the contrary notwithstanding, of the merchandise, at the time of exportation, and in the principal markets of the country whence the same has been imported into the U. States, and the number of such yards, parcels, or quantities, and such actual market-value or wholesale price of every of them, as the case may be.

4. When the duty upon any imports is subject to be levied upon the true market-value of such imports in the principal markets of the country from whence the importation has been made, or at the port of exportation, the duty is estimated and collected upon the value on the day of actual shipment, whenever a bill of lading must be presented showing the date of shipment. If the value is $100, or above, the bill of lading must be certified by a certificate of the U. States consul.

5. When an ad valorem rate of duty is imposed on any imported merchandise, or when the duty imposed is regulated by, or directed to be estimated or based upon, the value of the square yard, or of any specific quantity or parcel of such merchandise, the appraisement is made on the actual market-value, or wholesale price thereof, at the period of the exportation to the U. States, in the principal markets of the country from which the same has been imported, and the value such appraised is considered the value upon which duty must be assessed.

6. In determining the dutiable value of merchandise, are added to the cost, or to the actual wholesale price or general market-value, the cost of transportation, shipment, and transshipment, with all the expenses included, from the place of growth, production, or manufacture, whether by land or water, to the vessel in which shipment is made to the U. States; the value of the sack, box, or covering of any kind in which such merchandise is contained; commission at the usual rates, but in no case less than 2½ per centum; and brokerage, export duty, and all other actual or usual charges for putting up, preparing, and packing for transportation or shipment. All charges of a general character incurred in the purchase of a general invoice, are distributed pro rata among all parts of such invoice; and every part thereof charged with duties based on value, is advanced according to its proportion.

7. When the actual value to be appraised, estimated, as ascertained as hereinbefore stated, exceeds by ten per centum or more the invoice value, then, in addition to the duty imposed by law on the same, there is levied and collected on such merchandise twenty per centum of the duty imposed on the same, when fairly invoiced.

8. When merchandise of the same material or description, but of different values, is invoiced at an average price, and not otherwise provided for, the duty is assessed upon the whole invoice at the rate to which the highest valued goods in such invoice are subject.

9. If, on the opening of any package, a deficiency of any article is found, on examination by the appraisers, the same must be certified to the collector on the invoice, and an allowance for the same is made in estimating the duties.

10. In respect to articles that have been damaged during the voyage, the appraisers must ascertain and certify to what rate or percentage the damage is to be deducted from the original amount, subject to a duty ad valorem, or from the actual or original number, weight, or measure, on which specific duties would have been computed.

11. If the importer is dissatisfied with the appraisement, he may give notice to the collector, in writing, of such dissatisfaction; on the receipt of which the collector selects an experienced merchant to be associated with one of the general appraisers, to re-examine and appraise the goods. If they disagree, the collector decides between them; and the appraisement thus determined is final, and deemed to be the true value on which the duties are to be levied.

12. Any person who wilfully and corruptly swears falsely on an examination before any appraiser, or collector and naval officer, is deemed guilty of perjury; and if he is the owner, importer, or consignee, the merchandise is forfeited.

Apprentice, is an individual (generally under the age of twenty-one) who is subjected to an engagement to serve for a stipulated period under the practice of some trade or profession, in matters referring thereto, on condition of receiving instruction in return.

In the U. States, every male infant, and every unmarried female under the age of 18 years, with the consent of the persons or officers hereinafter mentioned, may, of his or her own free will, bind himself, or herself, in writing, to serve as clerk, apprentice, or servant, in any profession, trade, or employment; if a male, until the age of 21 years; and if female, until the age of 18 years, or for any shorter time: such binding will be as valid and effectual as if the infant were of full age at the time of making the engagement.—Such consent must be given by the father of the infant. If he be dead, or be not in a legal capacity to give his consent, by the mother. If the mother be dead, or be not in a legal capacity to give consent, or refuse, by the guardian of such infant duly appointed.—Such consent must be signified in writing, by the person entitled to give the same, by a certificate at the end of, or indorsed upon, the indenture.—The executors of any last will of a father, who shall be directed in such will to bring up his child to some trade or calling, may bind such child to service, in like manner as the father might have done. The county superintendents of the poor may, in like manner, bind out any child, under the ages above specified, who shall be sent to a county poor-house, to be clerk, apprentice, or servant. The overseers of the poor of any town or city possess the like power in such town or city, with the consent, in writing, of any two justices of the peace of the town, or of the mayor, recorder, and alderman of any city, or of any two of them.—The age of every infant bound as aforesaid must be inserted in the indenture, and will be taken as being the true age without further proof thereof; and public officers who act in such cases should inform themselves fully of the infant's age. Every sum of money paid, or agreed for, in relation to the binding out of any clerk, or apprentice, must also be inserted in the indenture.— Whenever any child is bound out by the county superintendents, or the overseers of the poor, the person to whom the infant may be bound must enter into an agreement, to be inserted in the indentures, that he will cause such child to be instructed to read and write (if a male, to be also instructed in the general rules of arithmetic), and that he will give such apprentice, at the expiration of his or her service, a new Bible. The counterpart of any indentures executed by the county superintendents must be deposited in the office of the clerk of their county; the overseers of the poor will deposit it in the clerk's office of their city or town.—No indenture, or contract, for the service of any apprentice, is valid, as against the person whose

services may be claimed, unless made in the manner above prescribed.—The master is entitled to all the earnings of the apprentice.—A guardian is liable, although the apprentice has gone off and left his master. — An apprentice is not assignable, although the assignment would be valid as a covenant for the services of the apprentice. — An apprentice cannot recover of an assignee, or an implied promise, where service has been voluntarily rendered. — The laws of this country recognize no general authority in a father to dispose of his children, except for some specific and temporary purpose, such as apprenticeships during the father's life, or guardianships after his death. — If any person lawfully bound to service, as above mentioned, wilfully absent himself without leave, he must serve double the time of such absence, unless he shall otherwise make satisfaction, but such additional term of service cannot extend beyond three years next after the expiration of the original term. — If any person refuses to serve, any justice of the peace of the county, or the mayor, recorder, or any alderman of the city where he shall reside, has the power to commit him to jail. — If any apprentice is guilty of any misdemeanor or ill behavior; or if any master be guilty of any cruelty, misusage, or refusal of any necessary provisions or clothing, or of a violation of the terms of the indenture, complaint may be made to any two justices of the peace of the county, or to the mayor, recorder, and alderman of the city, or any two of them, who will summon the parties before them and examine into the grounds of complaint; and if the same prove to be well founded, they must either commit the apprentice to solitary confinement in the common jail of the county, for a term not exceeding one month, then to be employed at hard labor; or discharge the offending apprentice from his service, and the master from his obligations; or in case of ill usage by the master, discharge the apprentice from his obligation of service. — The above statutory provisions in relation to apprentices wilfully absenting themselves, refusing to serve, or being guilty of any misdemeanor or ill behavior; and masters guilty of ill usage, etc., do not extend to such cases where the master or mistress has received, or is entitled to, any sum of money as a compensation for instruction. — In cases where money has been paid, or agreed to be paid, any justice of the peace of the county, or any mayor, recorder, or alderman of the city in which the apprentice resides, has the power of inquiring into all disputes in relation thereto, and of making such order and direction as the equity of the case may require. If the difficulty cannot be reconciled, the master or the apprentice may be recognized, in such sureties as the officer will approve, for his appearance at the next Court of Sessions, and such Court, on hearing the parties, may either discharge the apprentice from service, or order the sum of money to be paid, or to be refunded; or, if not paid, discharge the same, and direct the securities to be cancelled; or punish the apprentice by fine, or imprisonment, or both, as for a misdemeanor. — *J. S. Jenkins.*

Fig. 16. — Aquarium.

Apricot, is the fruit of *Prunus Armeniaca*, a native of Armenia, extensively cultivated in Europe. It is nearly related to the plum. It ripens earlier than the peach, which it resembles in some respects. The color of the *A.* is mostly yellow, with a red, brown, or yellow cheek on the side which is most exposed to the sun. It is propagated by budding on plum, peach, or wild cherry stocks. The *A.* is of inconsiderable commercial importance in America.

Apron, a lady's or workman's covering for the person; the sill of a window; a platform raised at the entrance of a dock; a false or inner stem above the foremost part of the keel.

Aps, a common name for the wood of the white poplar (*Populus alba*), extensively used for toys and common turnery purposes.

Aqua Fortis, an old term for dilute nitric acid.

Aqua Marine. See Beryl.

Aqua Regia. See Chlorine.

Aquarium, or Vivarium, is a tank or vessel (Fig. 16), in which living specimens of aquatic animals and plants are maintained. When an *A.* is provided with plants and animals in proper proportion, both will be easily kept healthy; the plants, under the action of light, consuming the carbonic acid gas given forth by the animals, and consequently restoring to the air, or water in which they live, the oxygen necessary for the maintenance of animal life. It is, however, necessary, for maintaining the uniform composition of the air in the water, to add certain animals which feed on

decomposing animal matter; such are the various species of molluscous animals, as the snail, etc. In some cases, when the supply is continuous, the fresh water maintains a healthy condition; and the same effect is obtained by a succession of bubbles of air introduced into, and ascending through, the water, to maintain the natural equilibrium destroyed by the animals breathing therein. Agitation of the water produces the same results more or less perfectly, but the effect is not so pleasing unless it is introduced with scenic devices or machines, such as paddles, self-acting fountains, etc.

Aquatint, a style of engraving, or rather etching on copper, by which an effect is produced similar to that of a drawing in Indian ink. It is now almost out of use.

Aqua Vitæ, [Fr. *eau de vie*,] a term absurdly applied to ardent spirits.

Arabia, an extensive region of Asia, extending from lat. 12° to 34° N. and lon. 33° to 60° E. It is bounded N. by Turkey in Asia; W. by the Red Sea and the Isthmus of Suez; S. by the Indian Ocean; and E. by the Persian Gulf. Area, 1,200,000 sq. m. *A.* is subject to a great variety of rulers, and its pop., vaguely estimated at 10,000,000, is composed partly of the commercial inhabitants of the coast, who form a regular society, and partly of *Bedouins* or pastoral Arabs, who live in tents, and subsist by their flocks, or by the plunder of passing caravans. *A.* is proverbially an arid country. Scarcely a single river exists; and almost the whole of the interior is occupied with sandy deserts — diversified only by a few *oases* or spots of fertility. Some of the districts of the coast, however, particularly Zemen, are fertile and beautiful. The *Hejaz*, or Sheriffat of Mecca, comprising the N. and W. part, bordering on the Red Sea, is the holy land of the Mohammedans, on account of its containing Mecca, the native town of Mohammed, and Medina, the city where he is interred. The chief products are coffee, which is grown in Yemen, at Bulgosa, near Beit-el-Fakih, gum-arabic, dates, pomegranates, figs, oranges, opobalsam, and a variety of odoriferous plants. Senna and the cotton-tree are also cultivated in Yemen; and indigo is cultivated about Zebir. There are no mines of the precious metals. *A.* has long been celebrated for its horses; the best are bred in the desert bordering on Syria. The native measures cannot be stated with accuracy. The Egyptian measures, weights, and moneys are now much used. The principal seaports are JIDDAH, MOCHA, and MUSCAT, q. v. See also CARAVAN.

Arabic Gum. See GUM-ARABIC.

Arachis Oil. See NUT OIL.

Aragu, crude stick-lac taken from the tree.

Arbitration, is a contract by which two or more parties engaged in a dispute agree, by an instrument called a submission, to leave the decision to a third party, called an arbiter or arbitrator. The submission is generally in the form of mutual bonds, binding each to obey the award under penalties. In contracts of partnership, it is usual, in many places, to insert conditions of *A.* which have the effect of preventing one member from resorting to a law-suit, unless a reference has proved ineffectual, or the others have refused to accede to it. The proper subjects of *A.* are those questions as to fact, which are generally referred to a jury — a liquid debt specified and defined by deed is therefore not a proper subject. Where there is more than one arbiter, there is generally authority to choose an umpire if they cannot come to a decision — and this last must be selected by voluntary choice, not by lot. The object of *A.* is a final determination, and so a restriction is void. Upon proving the submission and the award, by the affidavit of the subscribing witness, or by the affidavit of the arbiters, within one year after making such award, the court (which must be designated in such submission) shall, by rule, in open court, confirm the award made in pursuance thereof, unless the same be vacated or modified, or a decision thereon be postponed. The courts exercise considerable discretion in overlooking minute deficiencies, and allowing the evident meaning and intention of the various parties to be put in practice; and though an award be void as to some portion of it, yet, if it be specific in assigning to the parties the rights which the arbiters intended to bestow on them, it will be good as to the remainder. When a time is limited for making an award it cannot be protracted, except by prolongation consented to by parties, or permitted by rule of court. The courts will not relieve a person who has voluntarily submitted his case to an arbiter from the consequences of the decision, unless on grounds of corruption, partiality, or mistake.

Arbitration of Exchange, is the deduction of a proportional or *arbitrated rate* of exchange between two places through an intermediate place, in order to ascertain the most advantageous method of drawing or remitting. See EXCHANGE.

Arbois. See VIN DE PAILLE.

Arbor, a term used by watch-makers and others for an axis or spindle.

Archangel. See RUSSIA.

Archil. See ORCHIL.

Archim, or PIK, the Turkish ell = 30 inches.

Ardel, an Egyptian weight = 226 lbs.

Ardent Spirits, alcoholic liquors.

Ardoise, the French name for slate.

Are, the unit of the French measures of surface, equal to 100 sq. metres = 119·6 sq. yards.— *Centare*, equal to 1 sq. metre = 1·550 sq. inches.— *Hectare*, equal to 10,000 sq. metres = 2·471 acres.

Areca Nut. See BETEL-NUT.

Areometer. See HYDROMETER.

Argand Lamp, a burner or lamp in common use, with a circular wick to admit a double current of air.

Argent, the French name for silver metal and for coined money.

Argentan. See GERMAN SILVER.

Argentiferous, containing or yielding silver.

Argentine, a white metal coated with silver.

Argentine Confederation, [Sp. *Confederacion Argentina*,] a group of States of South America, lying between lat. 22° and 41° S., and lon. 57° and 70° W., formerly part of the Spanish vice-royalty of Buenos Ayres. Their constitution, which bears date May 15, 1853, is similar to that of the U. States, and the president is elected for 6 years by representatives of the 14 provinces. Area, 515,700 sq. m.; *pop.* 1,736,922.

The chain of the Andes runs along the whole western boundary, and the country for several hundred miles to the E. of this chain, is generally mountainous. The territory E. of the river Parana is waving, well watered, and fertile; but the district between that river and the mountains, extending from N. to S. through the whole length of the country, consists of extensive plains. In the N. these plains are in many parts liable to be overflowed; in the S. they are called *pampas*, and are remarkably dry, and destitute of trees. The country

is chiefly celebrated for the countless herds of wild cattle and horses, which roam in the vast natural pastures of the plains, and whose hides and tallow at present constitute the chief source of wealth. The land in the vicinity of the towns is generally cultivated, producing wheat, Indian corn, and barley, together with the sugar-cane, orange, cocoa, fig, olive, and vine. The public debt, amounting to $62,301,795, is for the most part in the hands of English bankers. The public revenue assigned to the central government is derived almost entirely from custom duties, which are very heavy. The public expenditures invariably exceed, at times very largely, the annual revenue. The *A. C.* has 991 m. of R.R. opened for traffic, and 311 m. in construction. The various lines are mainly constructed at the expense of the State.

The external commerce of the country is conducted entirely at the city of *Buenos Ayres*, the cap. of the republic, which is the outlet for the produce not only of the whole valley of the river La Plata, but also of large districts of Peru and Chili. It is a fine, healthy town, situated in lat. 34° 36′ S., lon. 58° 24′ W., on the right bank of the estuary of the river La Plata, and 150 m. from the ocean, almost facing Montevideo, which stands on the opposite bank of the river. *Pop.* 180,000. The river is here 35 m. broad, but so shallow in most parts that large vessels have to unload by means of lighters in the outer roads, distant 8 m. from the port; while small vessels cannot approach nearer than the inner roads, distant about 2 m. Even open boats cannot be brought close to the beach, and have to land, at no little risk, goods and passengers in rudely constructed carts. In 1877, the exports, made up to the amount of more than one-half by wool and tallow, amounted to $46,535,700. The imports, which in 1873 amounted to $71,065,195, had fallen, in 1877, to $34,910,290, the decrease being gradual. The foreign trade is chiefly with England and France, but the trade with the U. States is rapidly increasing. In 1878 it was as follows: Exports, $4,949,367, consisting chiefly of sheep's and alpaca wool, and hides and skins; imports, $2,013,587, chiefly made up by household furniture, boards, tobacco, cotton manufactures, spirits, starch, lard, petroleum, paper, perfumery, etc. During the same year, 41 American vessels (tonnage 20,940) entered the port, and 59 vessels (tonnage 30,945) sailed from it.—*Weights and Measures*, same as Spain.—*Money*. The *silver peso fuerte*, or silver dollar of 100 centesimos = $0.96·5. The circulating medium is chiefly composed of government paper money, called *peso*, which, by its overissue, has depreciated the value of the dollar to about 50 cents.

Argol, a common name for crude tartar, in the state in which it is taken from the inside of wine vats. See TARTAR.

Arica. See PERU.

Arindi, an East Indian agent or broker.

Aristolochia, or SNAKE-ROOT, [Fr. *serpentaire;* Ger. *Virginische schlangenwurzel*,] the dried root of the *A. serpentaria*, or Virginian snake-root. It consists of a short stock or head, with numerous rootlets three inches or more in length, thready, interlaced, and brittle; skin greenish-yellow or brown, and pith iron-colored. In odor and taste it resembles valerian and camphor. The root is all used, but the rootlets are more powerful than the solid part. It is employed in medicine, and its action is similar to that of camphor. *A.* is exported to Europe from Virginia and the Carolinas.

Arizona, a Western territory of the U. States, bounded on the W. by the Rio Colorado, on the E. by lon. 109° W. to the parallel of lat. 32° 40′, and thence N. W. to the Colorado River; on the S. by Sonora, on the boundary line between the U. States and Mexico, N. by the territory of Utah; area, 113,916 sq. m. The general surface is considerably elevated above the sea-level, and consists of wide plateaus, occasionally crossed by ranges of high mountains, and diversified by towering isolated peaks. Climate eminently salubrious throughout the year. The Little Colorado, Bill William's Fork, and Gila rivers, drain the whole territory. There is a considerable amount of land capable of irrigation, immense areas of grazing land, and abundance of mineral wealth. Gold, silver, iron, tin, gypsum, nickel, platinum, and copper. *Cap.* Tucson, in the valley of the Sta. Cruz. Other important places are Arizona City, Florence, Phœnix, Prescott, and Wickenburg. *Pop.* 9,658.

Fig. 17.—SEAL OF ARKANSAS.

Arkansas, a South-western State of the U. States, bounded N. by Missouri, E. by the Missouri River, S. by Louisiana and Texas, and W. by Texas and Indian Territory. It lies between 33° and 36° 30′ N. lat., and between 89° 45′ and 74° 40′ W. lon. Area, 52,198 sq. m., or 33,406,720 acres, on which only about 2,000,000, acres consist of improved land. The eastern portion of *A.*, for a breadth of from 30 to 100 m. from the Mississippi, is a low marshy plain, abounding in lagoons, and for the most part subject to the annual overflow of the Mississippi, and its tributaries. Toward the centre of the State, the land rises into hills, enlarging into the Ozark Mountains, the highest elevation of which is not over 2,000 feet. Besides the Arkansas River, that passes wholly through the State from W. to E., and the Mississippi, which receives all its waters, *A.* is drained in the N. E. by the White River and the St. Francis; in the S. W. by Red River; and in the S. by the Washita. The climate is moist and unhealthy in the E. part of the State, especially along the Arkansas River, but in the middle and W. parts it is comparatively salubrious. The soil is exceedingly fertile on the borders of the rivers, but as it recedes from them it becomes poorer, and barren in some of the more elevated parts. The staple products are cotton, Indian corn, and live-stock. *A.* has not engaged in manufactures to any considerable extent. Its principal towns are Little Rock (the cap.), Helena, Arkansas Post, Pine Bluff, and Fort Smith. *Pop.* 484,471.

Arkansas Central R.R., in progress, to run from Helena to Little Rock, Arkansas, a distance of 114 miles, with branches 264 miles. Offices at Helena. This Co. was formed by the consolidation of the Arkansas Midland and the Little Rock and Helena; it received State aid to the extent of $15,000 per m., 30 year 6% bonds, and county subsidies to the extent of $700,000 or $800,000 in bonds. The State also made a grant of 200,000 acres of land. Defaulted 1 Jan., 1874, in hands of receiver March, 1876, and sold in foreclosure 22 July, 1877. No reorganization yet effected. *Financial Statement* before sale: Cap. stock authorized, $2,500,000; funded debt, 1st mortgage 8% gold bonds, dated 1 July, 1871, and due in 20 years (guaranteed by State), $720,000, and 2d mortgage 7% gold bonds, dated 1 April, 1873, and due in 20 years, $700,000.

Arkansas Valley R.R., runs from Kit Carson to Puebla, Col., a distance of 140 m., of which 75·5 m. only are in operation. It was chart. in 1872, and sold under foreclosure 8 May, 1878, to purchasing committee for bondholders. *Financial Statement:* Cap. stock authorized, $3,000,000; paid in, $1,520,000; funded debt ($20,000 per m.), $1,125,000. Total stock and bonds, $2,645,000. Funded debt, 1st mortgage bonds, dated 1 April, 1873, payable 1903, interest 7% (April and Nov.). Offices at St. Louis, Mo. Net earnings, $9,640.88.

Armateur, the French name for a shipowner, or one who fits out a ship for a voyage.

Armenian Bole, a soft earth of a bright red

color, found in some parts of Europe, and also in India, where it is used in medicine, and also in native painting and gilding. It is imported from England as a dentifrice, and as a pigment. *Imp.* duty, 50 per cent.

Armenian Stone. See LAPIS-LAZULI.

Armor, a general term for defensive weapons and clothing. The *Imp.* duty on ancient armors, or modern imitations of the same, is 35 per cent.

Arms and Ammunition. See GUN, GUNPOWDER, etc.

Armures, are woollen, worsted, or other fabrics so woven as to produce on the surface a diagonal or other ridge.

Arnica, an herbaceous plant, *A. montana*, also called leopard's bane. The root, leaves, and flowers are poisonous when swallowed, and are even irritant to the skin, but are administered as a stimulant in paralytic affections, fevers, and other diseases. They are also applied with benefit for bruises. They contain a volatile oil, a resin, and the alkaloid *arnicine.*

Arnotto. See ANNOTTO.

Aromatics, are substances possessing a fragrant aroma, and usually a warm pungent taste. They are mostly obtained by distillation from flowers, leaves, roots, etc. They are largely used in the manuf. of cosmetics and other articles for the toilet; also in medicine.

Aromatic Vinegar, is nothing but ordinary vinegar, flavored and scented with certain essential oils, such as those of cloves, lavender, and rosemary.

Arrack, a common East Indian name for spirituous liquors of all kinds. *A.* was formerly prepared in considerable quantity at Goa, but the principal seats of manufacture at present are the islands of Java and Ceylon. In the former, it is commonly termed *kneip*, and is made from a mixture of 62 parts molasses, 35 parts rice, and 3 parts of the sweet juice called palm-wine or toddy, extracted from the flowers of different species of palm-trees. In the latter, it is entirely distilled from cocoa-nut tree toddy. Ceylon *A.* is reckoned superior to that of Java. In India, it is prepared from the flowers of the *Bassia longifolia*, the *Mahwah* tree, and the *Bassia latifolia.* In Turkey, it is distilled from the skins of grapes, and flavored with aniseed. *A.* is mostly imported into the U. States from Batavia, by way of Holland.

Arroba, a Spanish and Portuguese weight; also a Spanish measure of capacity. It varies in different places. The *A. weight*, Spanish standard = 25·36 lbs. avoirdupois; Alicant, 27·38 do.; Valencia, 28·25 do.; Arragon, 27·76 do.; Portugal, 32·38 do.; Argentine Rep., Bolivia, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, San Domingo, San Salvador, Uruguay, Venezuela, 25·36 do.; Brazil, 32·38 do.—The *A. measure of* capacity—Spanish standard for wine = 3·54 imp. galls., and for oil = 2·78 do. In all the above-named South American republics, it is equal to the Spanish standard.

Arrowroot, a farinaceous substance procured in various parts of America, the West Indies, and Ceylon, from the root of the *Maranta arundinacea;* and in India, from the tubers of the *Corcuma augustifolia.* It is prepared in nearly the same manner as starch; and when good, should be free from all musty flavor, white, insipid, and form a consistent jelly when dissolved in 8 parts of boiling water. It retains its nourishing property unimpaired for many years. *A.* forms a common article of food for children and invalids. It is now largely manufactured in Florida, but the best is imported from Bermuda, and commands in New York an average price of 40 cts. per lb. It is frequently adulterated with potato starch, and great care is necessary in purchasing it. *Imp.* duty, 30 per cent.

Arrow-Ties, are the iron fastener or buckle, and the hoop-iron used instead of rope in baling cotton.

Arsenic, [Fr. *arsenic;* Ger. *arsenik*,] an exceedingly brittle metal of a strong metallic lustre, and white color, running into steel-gray. Sp. gr. 5·9. This substance, however, being very soft, is of little value, and is not used in the arts. The *A.* of commerce is the *white oxide* of that metal, or more correctly *arsenious acid*, a compound which is obtained chiefly in Bohemia and Saxony, in roasting the cobalt ores for making zaffre, and also by sublimation from arsenical pyrites. It is brittle, white, faintly sweetish in taste, more or less translucent, and is generally met with in cakes, or their fragments, retaining the shape of the subliming vessel; sometimes it has a yellow or reddish tinge, owing to the presence of iron, sulphur, and other impurities; from these it is freed for pharmaceutical use by resublimation, when it is often obtained in vitreous transparent cakes, which, however, soon grow opaque and crumble. Sp. gr. 3·72. In the shops it is commonly offered for sale in the form of a fine smooth powder, which is liable to adulteration with chalk and gypsum; but the fraud is easily detected by exposing the suspected substance to heat, when the pure acid is entirely sublimed, and the additions remain. Arsenious acid, though one of the most virulent poisons, is used in medicine. It is also employed as an ingredient in the *Scheel's Green* and other dyes, in the manufacture of flint-glass, etc. *Imp.* (*A.* and crude arsenious acid) free. *A.* forms with sulphur, two compounds, which are known in commerce under the names of REALGAR and ORPIMENT, q. v.

Arsenic-Weight, the Dutch apothecaries' weight, the pound of which is equal to ⅞ of a pound avoirdupois, and, like it, subdivided into 16 ozs.

Arsheen, a Russian cloth measure = 28 inches, or 0·71 French metre.

Artata, a Persian measure of capacity = 1·809 bushel.

Artesian Well, a well sunk to a great depth by boring, to reach the spring and insure a continuous supply of pure water, or to sink surface refuse.

Artichoke, [Fr. *artichaut*,] an esculent vegetable (*Cynara scolymus*), having large perennial roots and annual stems, bearing large round heads. Each of these is composed of numerous oval calycinal scales, inclosing the florets, sitting on a broad fleshy receptacle; this and the fleshy bases of the scales, the only eatable parts of the plant, are gathered before the expansion of the flowers. The *A.* is not cultivated in this country, but preserved *A.* are occasionally imported from France.

Jerusalem Artichokes are the tubers of the *Helianthus tuberosus*, a kind of sunflower. This name is due to its strange resemblance in taste to the real *A.* They also form occasionally an article of importation, either in the tuber or in oil.

Artificial Flowers. See FLOWERS, ARTIFICIAL.

Artificial Limbs. See LIMBS, ARTIFICIAL.

Arzeneiwaaren, the German name for drugs or medical preparations.

Asarabaca, [Fr. *assaret;* Ger. *haselkraut,*] the root and leaves of the *Asarum Europæum*, a perennial plant, indigenous in W. Europe, but generally imported from the Levant. It contains a camphor-like principle, and a bitter essence which is combined with gallic acid. It is used in veterinary medicine, and also as an ingredient in most of the cephalic snuffs.

Asbestos, AMIANTHUS, or MOUNTAIN FLAX, [Lat. *amianthus asbestinum;* Ger. *asbert;* Fr. *amianthe;* Sp. *asbesto, alumbre de pluma;* Port. *asbestos;* It. *asbesto,*] a mineral (Fig. 18), of which there are several varieties, all more or less fibrous, flexible, and elastic, some very compact, and capable of being reduced to impalpable fibre. It is inconsumable by a high degree of heat, and in antiquity the art was discovered of drawing the fibres into threads, and then weaving them into cloth. In the Tarentaise of Savoy, a variety of *A.* exists, of which the threads are entirely separated, and of a brilliant whiteness, and capable of being elongated to upwards of ten times their original length. Cloths and even lace have been prepared from the

FIG. 18. — ASBESTOS.
(From an Italian specimen weighing 114 lbs.)

A. derived from this locality. Paper has also been made of it. The varieties of *A.* are twisted *A.*, which is of a dirty gray or whitish-yellow color, and sometimes exists in thick spongy pieces, being then vulgarly called *fossil flesh;* sometimes it resembles, and is called, *fossil cork;* occasionally, when of a hard, membraneous character, is called *fossil leather;* and the thinner and more flexible kinds of the same character are termed *fossil paper*. The woody *A.* is of a reddish-brown color, and resembles splinters of wood. *A.* is used to a considerable extent for burning in gas-stoves; incombustible paper has been made from it. *A.* is found in Piedmont, Savoy, Salzburg, the Tyrol, Dauphiné, Hungary, Silesia, Corsica, Cape of Good Hope, N. of Scotland, and Siberia. An ordinary quality of but little value is found at Staten Island, near New York. *A.* of various grades is also found abundantly in other parts of the U. States. *Imp.* free; when manufactured, duty 25 per cent. Several patents have been granted to Mr. H. W. Johns, of New York, who is the original inventor of nearly all the practical applications of *A.*, and has made its valuable properties known in all parts of the civilized world. *A.* is now extensively used for roofing, steam-pipe and boiler coverings, fire-proof sheathings, coatings, cements, paints, etc.

Ash, [Fr. *frêne,*] a tree of which there are many varieties. (Fig. 19.) The white ash (*Fraxinus Americana*), which abounds in the forests of the Northern States and in Canada, and the common ash (*F. excelsior*) of Europe, are very useful on account of their rapid growth, and the excellence of their hard, tough wood. The timber of the white ash is largely used for agricultural implements. It is also esteemed for the purposes of the coachmaker, cooper, and turner; and for ladders, poles, and other purposes which require strength, elasticity, and comparative lightness; while the underwood is excellent for hoops, rods, etc. It is, however, quite unsuitable for building purposes. as it neither stands moisture nor the weather.

Ashes, the saline and earthy particles of burnt substances. See BARILLA, KELP, POTASH, etc.

Ashlar, a name given to rough stones; and to freestones when they are first taken out of the quarry. The term is also applied to a facing made of nicely squared stones; the subordinate terms being *tooled, polished,* or *rustic*, according to the mode in which the surface is treated. See MASONRY.

Ashore. A ship is said to be *A.* when she has run upon the ground, or on the sea-coast, either by accident or design.

Ashrafi, or ASHRUFI, an East Indian coin, the gold mohur, worth 16 rupees, or $8.

Ashtabula, Youngstown, and Pittsburgh R.R., runs from Youngstown to Ashtabula Harbor, O., a distance of 62·6 m. Offices at Ashtabula. Organized 11th Feb., 1870. Leased from its opening (May, 1873) to the Pennsylvania Co. *Financial Statement:* Share capital paid in, $1,817,880; funded debt, $2,000,000; other liabilities, $197,085.-36; cost of R.R., appurtenances, and docks, $3,782,225.37. Other assets, $48,-739.50; balance debt of income account, $184,000.48; bonds, 1st mortgage, $1,500,000, due 1901, interest 7% (April and Oct.); 2d mortgage income, $500,000, due 1894, interest 7% (Jan. and July). Net earnings for 1877, $77,330.76.

Asparagus, [Fr. *asperge,*] a well-known esculent vegetable (*A. officinalis*), having a perennial root and annual stalks. The stems are cut for use when only a few inches above ground. This highly esteemed vegetable is extensively cultivated in most of the States.

Asphaltum, a species of bitumen produced by the decomposition of vegetable matter. It is solid, brittle, of a black color, vitreous lustre, and conchoidal fracture. It melts easily, and is very inflammable — burning, when pure, without leaving ashes. Sp. gr. from 1 to 1·5. It abounds on the shores and surface of the Dead Sea, in Barbadoes, and in Trinidad, where it fills a basin of 3 m. of circumference, and of a thickness unknown. A gentle heat renders it ductile, and when used with grease or common pitch, it is used for coating the bottoms of ships, and is said to protect them from the teredo of the West Indies seas. Trinidad *A.* is imported to a considerable extent into the U. States, where it is used in the fabrication of vari-

ous road and roof coverings, and for other kindred purposes.—*A. rock* is a bituminous limestone found at Seyssel and at Val-de-Travers. It contains about 85 per cent. of carbonate of lime, and 15 per cent. of bitumen. Sp. gr. 2·4. Though easily scratched with the finger-nail, it is difficult to break up with the hammer, showing malleable properties under the blows. It is superior for every purpose to the Trinidad *A.* — Bituminous mastic, sometimes called *asphaltic mastic* or *asphaltic cement*, is generally composed of mineral tar and some calcareous, silicious, or earthy substances in powder. *Imp.* duty on *A.*, 25 per cent.

Fig. 19.—FLOWERING ASH (*Fraxinus ornus*).

Aspic, a name for the oil of spike obtained from *Lavendula spica.*

Aspinwall. See COLOMBIA (UNITED STATES OF).

Ass, a domestic quadruped (Fig. 20) resembling the horse, but much inferior to that animal, both in beauty and utility. The ass has nearly the same mouth-marks as the horse, takes from 2 to 3 years in growing, and lives from 25 to 30. It is less subject to disease than the other, and, being content with scanty and coarse fare, is employed in England, Germany, France, etc., by poor people in drawing small carts and in carrying burdens; the female is, besides, valued for her milk. The abject condition of this creature in northern climes is in part owing to its never being the subject of attention. In Eastern countries, particularly in Arabia, where the breed is not only carefully tended, but frequently improved by intercourse with the fleet and fiery onager (or wild ass), it is an animal of great strength and considerable beauty.

Assafœtida, [Fr., It., and Por., *assafetida;* Ger. *stinkander asand;* Ar. *hiltect;* Per. *ungoozeh,*] a medicinal gum-resin, composed of the juice of the roots of the *ferula assafœtida*, a large umbelliferous plant growing in the prov. of Khorassan and Laristan, in Persia. In its recent state it is white and semi-fluid, but by exposure to the sun it gradually hardens, and assumes a reddish color. In trade it is met with in large, irregular agglutinated masses of a waxy consistence, having a motley appearance owing to the mixture of white drops with others of a violet, red, and brown tint. It has a nauseous alliaceous smell, and a bitterish acrid taste. Those masses are to be selected which are clear, of a pale reddish color, and variegated with a number of elegant white drops or tears. An inferior kind, full of sand and very fœtid, is said to be a compound of garlic, sagapenum, turpentine, and a little of the real gum. *A.* loses some of its smell and strength by keeping; it should, therefore, be preserved in bladders shut up in tin boxes, and kept apart. It is imported in mats, casks, and cans, from England, which country receives it from India, whence it is exported from Persia. The Treasury regulations of the U. States require it to contain 50 per cent. of its peculiar bitter resin, and 3 per cent. of volatile oil. *Imp.* duty, 20 per cent.

Assault, an attempt or offer, with force and violence, to do a corporeal hurt to another; as by striking at him, with or without a weapon. Assault does not always necessarily imply a hitting or blow; because, in trespass for assault and battery, a man may be found guilty of the assault, and acquitted of the battery. But every battery includes an assault. If a person in anger lift up or stretch forth his arm, and offer to strike another, or menace any one with any staff or weapon, it is an assault in law; and if a man threaten to beat another person, or lie in wait to do it, if the other is hindered in his business, and receive loss thereby, an action lies for the injury. Any injury, however small, actually done to the person of a man, in an angry or rude manner, is a battery.

Assay or **Assaying** [Fr. *coupellation;* Ger. *abtreiben der capelle*], is a mode of ascertaining what proportion of gold or silver there is in an alloy of those metals. When an alloy of (say) silver is melted, the inferior metals become oxidized, and can be removed as a kind of scale. The assay, or cupel furnace, is a small upright stove, having within it a wagon-like earthen vessel called a *muffle*, closed at all parts except one end, and a few slits in the top and side. Small crucibles called *cupels* are placed in the muffle, which shield them from contact with the fuel in the furnace. The cupels are small cups, made of some substance that will not be acted upon by the fused oxides, while their texture is sufficiently porous to let the oxides penetrate. The silver alloy and a bit of pure lead, both accurately weighed, are put into a cupel at a full red heat. A litharge, or oxide of lead, gradually forms, and is absorbed by the substance of the cupel carrying down with it the copper or other base metal of the alloy, while the remainder of the lead goes off in fume. When this process is carefully conducted, the button or globule of silver becomes absolutely pure. The cupel is taken out of the muffle and gradually cooled. The globule is weighed, and the difference between it and the weight of the original silver put in represents the weight of inferior metal with which the latter was alloyed. The proportion of alloy found in the silver is denoted by decimals. Thus, absolutely pure silver being reckoned at 1,000, any alloy of silver is reckoned at some lower figure; such as standard silver, which is said to be 925, there being 925 of silver and 75 of copper in 1,000 of standard silver. Gold is more difficult to assay than silver, because there is usually some silver as well as copper in the alloy. A special process, called *parting* or *quartation*, is often needed in addition to the cupellation. A *touchstone* is sometimes used, to furnish a rough guess at the composition of a gold alloy. (See TOUCHSTONE.) Besides the mode of assay-

ing by cupellation, there is what is called the *humid* way. A solution of chloride of sodium, in which the exact proportion of salt to water is ascertained, is employed as a means of determining the proportion in which silver and copper exist in any alloy.

Assets, [Fr. *actif*,] designate property presumed to be set apart to meet any obligation; thus the acceptor of a bill is said to have assets of the drawer in his hands. It is also commonly used in trade to designate the stock, cash, and all available property of a merchant, in contradistinction to his *liabilities* or obligations.

Assignee, a person to whom an involved, insolvent, or embarrassed debtor transfers and commits his property and estate for the benefit of his creditors. An *A.* is clothed with the powers and responsibilities of a trustee; he is liable only for want of ordinary skill and care. See INSOLVENT LAWS.

Assignment, an instrument in writing by which a merchant whose affairs are involved, or who is embarrassed or becomes insolvent, transfers his property and effects to a responsible party, called *assignee*, in trust for his creditors. See INSOLVENT LAWS.

Assignor, one who makes an assignment.

Assizement, a legalized inspection of weights and measures, and of the quality of commodities, etc.

Ass-Load, the pack-load for an ass; the average weight of which, in South America, is 170 lbs.

Association, a union of persons for some common object; a joint-stock company.

Assortment, a selection or variety of goods, samples, etc., of the same class or kind, but varying in quality, color, form, or price.

Assurance. See LIFE INSURANCE.

Asteria, a species of star sapphire, exhibiting six milk-white rays, radiating from the centre of an hexagonal prism.

Astrakan, is the wool or fur of a peculiar kind of sheep raised in Bokhara, Asia. This fine wool is the object of a considerable trade at Astrakan, in Russia, whence its commercial name.

Asumbra, a liquid measure in Paraguay = 4 gallons.

Atchison and Nebraska R.R., runs from Atchison, Kans., to Lincoln, Neb., a distance of 148·89 m. Office in Boston, Mass. Founded in 1870, the Co. was reorganized in 1878. Under new organization, *Financial Statement* will be: Cap. stock (for 70 % of old bonds), $2,625,000, and (for 50 % of unpaid coupons) $712,500; total, $3,337,500, and funded debt (for 30 % of old bonds), 1st mortgage 7 % 30 year bonds dated 1 March, 1878, $1,125,000. Total liabilities, $4,462,500. Net earnings for 1878, $95,645.87.

Atchison, Topeka, and Santa Fe R.R., runs from Atchison, Kans., to Colorado State line, a distance of 471 m. This Co. was organized in March, 1863, and operates six other Cos. under lease, which have a total length of 749 m.—Total distance run over by this Co., 1,220 m. The Co. has besides leased the New Mexico and S. Pacific R.R. (in course of construction) from the S. branch Pueblo road at Trinidad to Albuquerque, a distance of 248 m. Transfer office, Boston, Mass. *Financial Statement*, 1877: Funded debt, 1st mortgage bonds issued 1869, $15,000 per m. authorized; $7,041,000 outstanding, payable 1899, interest 7 % (Jan. and July). Land grant bonds issued 1870, authorized $7,500 per m.; outstanding, $3,366,000, payable 1900, interest 7 % (April and Oct.). Consolidated bonds issued 1873; amount authorized, $7,500 per m.; amount outstanding, $3,349,000, payable 1903; interest 7 % (April and Oct.). Land income mortgage issued Jan. 1, 1878; amount authorized, $480,000; payable 5-20's, interest 8 % (Jan. and July). Pottawattomie land mortgage bonds issued 1869; amount authorized, $800,000; amount outstanding, $439,000, payable 1 Nov., 1879; interest 7 % (May and Nov.). By an act approved 3d March, 1863, Congress granted 10 sections of land per m. The estimated quantity within the limit is 2,932,784 acres, of which 2,474,686 acres had been certified to the Co. to 30 June, 1877. Sales to Dec. 31, 1877: 643,598 acres had been sold, at the average price of $4.98. Net earnings for 1877, $1,356,421.69.

Atelier, a French workshop, sculptor's studio, or building dock.

Athens. See GREECE.

Athol Brose, strong whiskey in which honey has been intimately dissolved by careful trituration, used as a morning dram in some parts of Scotland.

Atlanta and Charlotte Air-Line R.R., runs from Atlanta, Ga., to Charlotte, N. C., a distance of 269 miles. This Co., whose offices are in Atlanta, Ga., was formed in Feb., 1877, by the bondholders on the sale of the road under foreclosure in Dec., 1876. *Statement of Funded Debt:* 1st mortgage preference bonds, dated 1877, $500,000, due 1897; interest 7 % (April and Oct.). 1st mortgage bonds dated 19 May, 1877, $4,250,000, due 1907; interest 7 % (Jan. and July). Net earnings for 1877, $60,389.90.

Atlantic and Great Western R.R., runs from Salamanca, N. Y., to Dayton, O., a distance of 387·50 m.; branches and leased lines, 158·68 m.; total, 546·18 m. This Co., whose offices are at Meadville, Pa., was organized in 1871, and placed in the hands of a receiver 10 Dec., 1874, by whom it has since been operated. *Financial Statement:* Cap. stock authorized, $50,000,000; funded debt, $68,994,811.28; floating debt, $6,475,126.80; total stock, bonds, and debt, $110,147,742.18. Funded debt in detail: 1st mortgage bonds, $14,922,200, payable 1902; int. 7 % (Jan. and July); 2d mortgage, $10,173,679.69, payable 1902; int. 7 % (March and Sept.); 3d mortgage, $28,784,000, payable 1902; int. 7 % (May and Nov.); Ohio 1st mortgage, $2,416,300, payable 1876; int. 7 % (April and Oct.). Reorganization stock, etc., $661,131.59; leased line trust, payable 1902, $5,323,000; int. 7 % (Jan. and July); leased line trust, payable 1903, $2,907,000; int. 7 % (Jan. and July); Western Extension certificates, July, 1876, $2,059,000; Western Extension bonds, $1,748,500. Net earnings for 1877, $968.917.36.

Atlantic and Gulf R.R., runs from Savannah to Bainbridge, Ga., a distance of 237 m., with branches 110·17 m.; total, 350·17 m.; and has its offices in Savannah. Default was made on the consolidated bond coupons, due 1 Jan., 1877, and two receivers were appointed in March following. Int. is still paid on the 1st mortgage sectional bonds. *Financial Statement*, Dec., 1876: Cap. stock, $3,693,700; 7 % guarantee stock, $782,976.69; funded debt, $3,566,500; bills payable, $126,268.35; traffic earnings (1876), $959,377.94; current accounts, $245,492.57; total, $9,374,315.59. Net earnings for 1876, $352,913.29.

Atlantic and North Carolina R.R, runs from Goldsboro' to Morehead, N. C., a distance of 95 m. This Co., whose offices are at New Berne, N. C., was chartered in 1853, and opened in 1858. About one-half the cap. stock is held by the State of N. C. *Financial Statement:* Cap. stock, $1,600,000; and funded debt, 1st mortgage 8 % bonds, dated 1868, payable 1888, $200,000.

Atlantic and St. Lawrence R. R., runs from Portland, Me., to Island Pond, Vt., a distance of 149·5 m., with a branch from Lewiston to Auburn, 5·5 m.; total length, 155 m. Chartered in 1845, and leased, in 1853, to the Grand Trunk R.R. of Canada for the interest on the outstanding bonds and 6 % annual dividend on capital stock. Office in Portland, Me. *Financial Statement:* Cap. stock, $5,000,000; funded debt, $3,484; total stock, bonds, and debts, $8,484,000.

Atlantic and West Point R.R., runs from East Point to West Point, Ga., a distance of 80·74 m. Offices at Atlanta, Ga. Chartered as Atlanta and La Grange R.R. Co. in Dec., 1847. *Financial Statement:* Cap. stock, $1,232,200. Debenture bonds, $83,000. Net earnings for 1878, $13,435.40.

Atlantic, Mississippi, and Ohio R.R., runs from Norfolk, Va., to Bristol, Tenn., a distance of 408 m., with branches 428 m. This Co., located at Lynchburg, Va., was organized in 1870 by the consolidation of the Norfolk and Petersburg, the South Side, and the Virginia and Tennessee R.R. The State of Virginia holds a controlling interest in all these lines. Under the act of consolidation they were sold to the A. M. and O. R.R. Co. for $4,000,000, secured by a 2d mortgage on the whole property, the 1st mortgage thereon never to exceed $15,000,000; these bonds to receive no interest before July, 1880, and from that date 6% per annum. Final payment to be made in annual instalments of $500,000 each; the first payment during 1885. In 1876 the property passed into the hands of receivers. Cap. stock, $6,921,900. Average rate of interest on funded debt, 7·06 %. Net earnings for 1877, $600,633.09.

Atlas, a large kind of paper 34 by 26 inches; a rich Indian embroidered satin; also a collection of maps in one volume.

Atmometer, an evaporometer, or instrument to measure vaporous exhalations.

Atropia, a formidable alkali obtained from the deadly nightshade.

Attachment, is a process by which a person may be apprehended, or a property seized, by virtue of a writ or order issued by a court or judge under authority of law. In respect to property the term is usually applied to seizure on mesne process. In some of the States, a plaintiff can, at the commencement of any action to recover money, attach the property of the defendant; but the more usual rule is that there can be no seizure of property, except in specified cases, till the rights of the parties have been settled by judgment of the court. The exceptions are chiefly when the defendant is a non-resident or a fraudulent debtor, or is attempting to conceal or remove his property for the purpose of defrauding or delaying his creditors. An *A.* is said to be foreign when a creditor attaches property belonging to his debtor in the hands of a third person, or a debt due to such debtor by a third person. The laws of each State on *A.* of property will be found noticed under the heading INSOLVENCY.

Attar of Roses. See ROSES (OIL OF).

Attestation, the legal act of witnessing a deed by affixing one's signature thereto.

Attire, articles of clothing or dress.

Attorney, a representative or deputy, one holding a power or authority to act for another. (See POWER OF ATTORNEY.) An *A. at law* is an officer of a court, who is authorized by the laws and rules of the court to prosecute or defend a claim or suit, without any special written authority for the purpose. An *A.* at law has authority, for and in the name of his principal, to do any acts necessary for conducting a suit, and his employer is bound by his acts.

Aubergine, the French name for egg-plant.

Au Besoin, [Fr., in case of need,] "*Au besoin chez Messieurs —— à ——*," "In case of need, apply to Messrs. —— at ——," is a phrase used in the superscription of a bill of exchange, pointing out the person to whom application may be made for payment in case of failure or refusal of the drawee to pay.

Aubusson, a town of France, celebrated for its manuf. of carpets, known as *Aubusson carpets*, and made in the style of the Louises of France.

Auctioneer, is a person whose business is to sell the goods of others by public outcry, vendue, or auction. He is the agent of both parties, the seller and the buyer. It is his duty, previously to the commencement of every sale, to state the conditions under which the goods are offered; to receive the respective biddings, and to declare the termination of the sale. For these purposes he commonly makes use of a hammer, upon the falling of which the biddings are closed. In most of the States, an *A.* is required to have a license to sell, and in the State of New York he is required to give bonds to the amount of $10,000, conditioned for the faithful performance of the duties of his office, to render a semi-annual account of all goods sold or struck off, and to pay on the amount of these sales the duties chargeable according to law, as follows: On all wines and spirits, foreign or domestic, 1 per cent.; on all goods and effects imported from any place beyond the Cape of Good Hope, 50 cents; and on all other goods and effects which are the production of any foreign country, 75 cents. Articles of the growth, produce, or manuf. of the U. States, except distilled spirits, are exempt from auction duties. Goods and chattels, otherwise liable to such duty, are exempt from the same, if sold under any judgment of any court of law or equity; if they belong to the estate of a deceased person, and are sold by a person duly authorized; if they be the effects of a bankrupt or insolvent, and be sold by his assignees; or if they be goods damaged at sea, and are sold within 20 days after being landed, for the profit of the owners or insurers. An *A.* is bound to observe strictly his instructions, and to act in good faith to the owner of the goods; he is not at liberty to misrepresent to the bidders or purchasers; he is liable for loss by negligence; and he cannot purchase the property he is employed to sell. An *A.* has a lien for his commissions, and can sue the buyer for his purchase-money. In the State of New York, no *A.* can demand or receive a higher compensation for his services than a commission of 2½ per cent. on the amount of any sale made by him, unless in pursuance of a previous agreement in writing. In the city of New York, all goods, wares, and merchandise, and every species of property, except ships, vessels, real or

leasehold estate, exposed for sale at auction, and struck off by the *A.* to the previous owner, or to any person bidding in his behalf, or to any fictitious person, or in any other manner than as an actual sale and purchase, are subject, each and every time they are so struck off, to a duty of 5 per cent. Any person offending against this provision is liable to a fine not exceeding $100, and imprisonment not exceeding one month.

Audit, a regular examination of books, vouchers, or accounts by one or more qualified parties.

Auditor, one who inspects or examines and certifies accounts; an accountant.

Aufgedinge, the money premium received with an apprentice in Germany.

Auger, a very useful tool for boring holes, is one of a class which all workers in wood are well acquainted with. Some have upright handles, some transverse; some have plain stems, some hollow, some screwed; and the mode of working, by to-and-fro twisting movement or by screwing, depends on these forms. The *auger*, *brad-awl*, *gouge-bit*, *centre-bit*, *gimlet*, and *screw-auger* are familiar examples of these hole-boring tools.

Augsburg. See Bavaria.

Aurantia Wine, a wine made in India and Sardinia from the China orange, *Citrus aurantium.*

Auriferous, containing or yielding gold.

Aurist, an ear-doctor, one who attends to the cure of disorders of the ears.

Australia. See New South Wales, Queensland, South Australia, Tasmania, Victoria, Western Australia.

Austria-Hungary, a European Empire, extending from 45° to 51° N. lat., and from 8° 35′ to 26° 35′ E. lon., is bounded N. by Prussia and Russian Poland, E. by Russia and Turkey, S. by Turkey, the Adriatic Sea, and Italy, and W. by Switzerland and Bavaria. It forms a bipartite State, consisting of a German, or *Cisleithan* monarchy, and a Magyar, or *Transleithan* kingdom, the former officially designated as Austria, and the latter as Hungary. Each of the two countries has its own parliament, ministers, and government, while the connecting ties between them consist in the person of the hereditary sovereign, in a common army, navy, and diplomacy, and in a controlling body known as the Delegations. The public debt of the whole empire — exclusive of the special debt of Hungary, in 1878 — was $1,631,685,040. Besides, the floating debt was estimated at $220,904,205. The total annual interest on the debt amounted to $56,648,040. The private debt of Hungary was $177,000,000. In recent years the published accounts of *A.* show invariably a declining revenue with growing expenses. The monarchy is subdivided as follows:

I. Austrian Empire.	Sq. m.	Population.
Lower Austria	7,655	1,990,708
Upper Austria	44,633	736,557
Salzburg	2,767	153,159
Styria	8,671	1,137,990
Carinthia	4,006	337,694
Carniola	3,857	466,334
Coast Land	3,085	600,525
Tyrol and Vorarlberg	11,325	885,789
Bohemia	20,064	5,140,544
Moravia	8,585	2,017,274
Silesia	1,988	513,352
Galicia	30,313	5,444,689
Bukowina	4,036	513,404
Dalmatia	4,940	456,961
Total, Austrian Empire	115,925	20,394,980

II. Kingdom of Hungary.	Sq. m.	Population.
Hungary, including the Banat	87,043	11,530,397
Croatia and Slavonia	16,773	1,846,150
Transylvania	21,215	2,115,024
Town of Fiume	8	17,844
Total, Hungary	124,438	15,509,455
Total, Austro-Hungarian Monarchy	240,943	35,904,435

The country is generally mountainous; large plains, however, occur, chiefly in Hungary and Galicia. Three climateric belts are distinguished, viz.: 1. the N. belt, from the N. frontier to N. lat. 49°, producing grain and flax; 2. the Central belt, between N. lat. 49°–46°, yielding wine, fruit, and the cereals; and 3. the S. belt, between N. lat. 46°–45°, furnishing, besides the above, semi-tropical fruits. The mean temperature varies between 39°–56° F. The soil, though of endless variety, is in general fertile; but in agriculture, *A.* is still behind other European States. The mines of gold and silver in Hungary and Transylvania, and of quicksilver at Idria in Carniola, are the richest in Europe; lead and copper are produced in considerable quantities; the supply of iron is almost inexhaustible; and indeed nearly every metal is found, except platinum. Salt, vitriol, alum, soda, sulphur, and saltpetre are found in great quantities. Scarcely a province is deficient in coal. Marble and a variety of precious stones also occur. The produce of the vine is a source of considerable wealth, and a large quantity is exported; the finest is the celebrated Tokay, made at Zemplin, in Hungary. Tobacco, hops, hemp, flax, and potash are produced in sufficient quantity to afford a surplus for exportation.

The manufacturing interests of *A.* have largely increased since 1860, when freedom of trade was established throughout the empire; they embrace textile goods, iron-ware, silk, leather, paper, chemicals, beer, liquors, tobacco, etc.

The most important river is the Danube, which, with its tributaries, pervades the whole empire, crossing, however, its eastern boundary at about 500 m. from the sea. Its navigation is throughout rather difficult, owing to shoals and rapids. In 1878 the whole empire had 10,138 m. of railroads open for traffic, and 2,633 in construction. Its commercial marine consisted of 7,538 vessels, 330,298 tonnage, of which 98 were steamers.

Nearly two-thirds of the commerce of *A.*, both as regards imports and exports, is carried on with Germany. Its next important market is Turkey. The commercial intercourse of *A.* with the U. States is comparatively small; and it appears in the official returns even smaller than it is in reality, owing to the geographical position of the empire, which necessitates the transit of many Austrian and American goods through other countries, as the exports and imports of which they come to figure. The value of direct exports to the U. States in 1878 was only $272,250, while the imports reached $2,827,581, consisting chiefly of mineral oil, grain, tobacco, tallow, etc.

There are 9 towns with over 50,000 inhabitants, viz.: — in Austria proper, Vienna (the cap.), 1,001,999; Prague, 189,949; Trieste, 109,324; Lemberg, 87,109; Gratz, 81,119; and Brünn, 73,771; — and in Hungary, Buda-Pesth, 270,474; Szegedin, (almost entirely destroyed, with enormous loss of life, by the overflow of the Theiss, in March 1879,) 70,179; and Maria-Theresiopol, 56,323. The chief ports are Trieste, Fiume, Rovigno, Capo d'Istria, and Pola, in Illyria; and Ragusa, Cattan, Zara, Sebenico, and Spalatro, in Dalmatia. The foreign trade is, however, almost wholly engrossed by Trieste.

Trieste is situated in 45° 39′ N. and 13° 46′ E., at the N. E. extremity of the Adriatic. *Pop.* 109,324. It has a commodious harbor, and being a free port, and almost the only outlet for the South of Germany, Illyria, and parts of the Sclavonian provinces, its commerce is very extensive, and the U. States have there a general consul. Here is established (since 1833) the *Gesellschaft des Oesterreichisch-Ungarischen Lloyd*, which owns a fleet of 65 steamers, of 15,260 horsepower, and absorbs the greatest part of the trade of *A.* with the East, through the Suez Canal, being subsidized by the Imperial government. The Bank of Austria has a branch at Trieste. In 1878, Trieste received 6 American vessels, tonnage 3,806, while 16 vessels, tonnage, 8,225, cleared the port.

The *Austrian National Bank* was founded in 1815, and is the only State Bank of *A.* Though connected with the government, it is under the management of a body of directors; and its accounts are published periodically. Its functions are chiefly those of issuing paper, discounting commercial bills, and developing certain kinds of public works. It has the sole right of issuing notes. It appears that the chief danger that the bank runs is that consequent upon advances to government, which are made, as might be expected, profusely in times of pressure, which advances are accompanied with a large increase in the issue of paper. The bank allows no interest on deposits.

Money. — The *Florin*, or Gulden, of 100 neu-kreuzer = 48½ cts. The *Golden Crown* of 8 florins = $3.88.

The legal standard in the empire is silver, and the florin, divided into 100 neu-kreuzer, the unit of money. Practically, the chief medium of exchange is a paper currency, consisting of bank-notes of all denominations, from 1,000 florins down to 1 florin, convertible only at a large discount into gold.

Bills upon Vienna are generally drawn in effective, and generally the particular coin in which they are to be paid is specified. Usance is 14 days after acceptance; 3 days of grace are allowed, except when drawn at less than 7 days' sight or date.

Weights and Measures.—The *Centner* (100 *Pfund*) = 123½ lbs. avoirdupois. The *Eimer* = 14·94 wine gallons. The *Joch* = 1·43 acre. The *Metze* = 1·7 imperial bushel. The *Klafter* = 67 cubic feet. The *Meile* (24,000 Austrian feet) = 8,297 yards, or about 4¾ m.

Autographic Press, a portable printing machine for taking copies of a writing or drawing, transferred from paper to a lithographic stone.

Automaton, is a self-moving machine. In many engines, and machinery, *automatic action* is the name given to a self-regulating apparatus; and speaking in a general way, whenever a process hitherto performed by hand is brought within the power of a machine, the apparatus becomes automatic in this particular instance. A watch or clock is an *A.* when wound up. It is in this sense that the word *A.* is generally used — action begun and maintained as soon as a train of wheels is set in motion by winding up. Wonderful examples of ingenuity in this form have been produced, in no other way useful than as showing what men *can* do if they try.

Autophon, a barrel-organ, the tunes of which are produced by means of perforated sheets of mill-board.

Ava, a long measure in Cadiz, the 16th part of the vara — rather more than two inches.

Aval, [Fr.] the signing of a draft, note, or bill of exchange; a French declaration of responsibility or guarantee for its payment.

Avens-Root, the root of the herb bennet, *Geum urbanum*, which, possessing astringent and aromatic properties, has been used in medicine, and is also said to impart a pleasant clove-like flavor to wine and beer.

Aventurine, a yellow or reddish-brown variety of quartz freckled with gold spots, found in Siberia, Bohemia, France, Spain, and India, and used in jewelry. Beautiful imitations of this mineral are now made by fusing sand, carbonate of soda, carbonate of lime, and bichromate of potash.

Avellana, the Spanish name for the filbert.

Average, in *Arithmetic*, is the *mean* of two or more quantities, formed by adding them together, and dividing by the number of quantities. Thus, 4 is the *A.* of 2 and 6, and 5 is the *A.* of 2, 6, and 7. The *A.* most commonly required in trades are those of prices. Ex.: What is the *A.* price per quarter of 300 quarters rice at $15 per quarter, 260 quarters at $13.50, and 270 quarters at $12.50?

300	quarters	at	$15.00	=	$4,500
250	"	"	13.50	=	3,375
450	"	"	12.50	=	5,625
1,000					$13,500

Ans. $13.50 per quarter.

In calculations of this kind, it must be remembered that the *A.* of a set of averages is not the *A.* of the whole, unless there are equal numbers of quantities in each set averaged. See ALLIGATION, and EQUATION OF PAYMENTS.

Average, in the law of shipping, is generally applied to the loss occasioned by any sacrifice made to insure the safety of a ship and cargo, and being a loss which underwriters have to replace, it constitutes part of the law of insurance. There are, technically speaking, two sorts of *A.*, *general A.*, and *single* or *particular A.* The latter is an unmeaning term, used merely in contradistinction to the other; to express those losses arising from the danger of the sea and otherwise, which are not made up by any contribution, but fall on the possessor of the article lost, or on those who may be responsible for its safety. The system of general *A.* is in full practice over all the commercial world. The circumstance under which the provisions of this law can be had recourse to is, when a vessel and the crew, passengers, and cargo, are in such imminent danger as to render it necessary to make a sacrifice of a part, for the preservation of the whole. The simplest case is that of throwing goods overboard (jettison) to lighten the ship. Here cargo is sacrificed, and the other proprietors of cargo, along with the ship-owners, bear a share of the loss, according to their respective interests. In another instance, it may be necessary to cut away a mast, or slip an anchor. Here the sacrifice is against the ship-owners, and the other parties interested must share the loss with them. It is of no moment how light and valuable may be the goods thrown overboard, or how much the reverse those saved. Goods stowed on deck are presumed to be an incumbrance, and so not suitable subjects of *A.* A loss effected by inherent defect, or by sea-risk, cannot be considered *A.*; there must be an intention to sacrifice; and that intention must have been with the view of preserving the remaining property embarked in the adventure. It is held, that when a vessel having sustained an injury has to put into a port for repairs, the expense of putting into port and remaining there, is to be considered *A.* loss, if the act was necessary for the safety of all concerned, but that the expense of the repairs (unless in so far as they may be solely necessary for the preservation of the cargo) falls on the ship-owner. Property injured in the making of the sacrifice — such as a part of the ship cut away to facilitate the throwing overboard of goods — constitutes *A.* An accurate statement of the circumstances under which a jettison, or other loss on which *A.* is claimed, should be entered in the log, and immediately on arrival, the master should draw up a narrative of the circumstances, and make affidavit to them, along with his crew, that there may be no ground to presume that goods have been removed since arrival. The adjustment is generally made thus: the owners contribute according to the net value of ship and freight at the port of delivery, after deducting expenses. But ship's provisions, wearing apparel, and seamen's wages, do not contribute. If the vessel has had to put back to the port of lading, the cargo is taken at invoice price; otherwise, the cargo is valued at the price it would bring at the port of destination, deducting freight and charges. Ships' furniture is rated at the cost of removal, with a deduction of one-third. The value of what is lost being thus estimated, is added to the value of what is saved, and the whole being divided according to the respective interests of the parties, the loss which each has to suffer is a sum bearing the same proportion to his share of the whole sum divided, which the loss sustained bears to the whole sum.

Average-Stater, one whose business is to compute averages.

Averruncator, an instrument for pruning young trees.

Aviary, an enclosure for keeping and rearing birds, made of wire-netting or wooden framework.

Avignon Berries, or PERSIAN BERRIES, the

small yellow dyeing berries of commerce, the produce of the buckthorn, *Rhamies amagdalinus*, which grow in South France, and are also imported from Persia.

Avocado Pear, the pulpy fruit of *Persea gratissima*, highly esteemed as a vegetable in tropical countries; oil has been made from it.

Avoine, the French name for oats.

Avoirdupois, the name given to the common system of weights, by which are weighed all commodities except medicines, the precious metals, and gems. A pound *A.* contains 7,000 gr.; an ounce is equal to $437\frac{1}{2}$ gr. A cubic foot of water weighs 997·17 oz. *A.*

Table of Avoirdupois.

$27\frac{11}{32}$ grains	= 1 dram	*dr.*
16 drams	= 1 ounce	*oz.*
16 ounces	= 1 pound	*lb.*
25 pounds	= 1 quarter	*qr.*
4 quarters	= 1 hundredweight,	*cwt.*
20 hundredweight	= 1 ton	*ton.*

Awa, the Japanese name for Indian corn.

Award, the decision given by an arbitrator; the amount of salvage or other sum granted by a competent court.

Awl, a shoemaker's and saddler's piercing tool. Steel bars drawn to the square of $\frac{1}{16}$ of an inch or less are imported from Sheffield, and extensively manuf. into awls in Rhode Island.

Awning, the trade name for a kind of ticking manufacture for awnings.

Awnings, a canvas canopy or covering fixed to keep off the sun in boats or ships, and also to

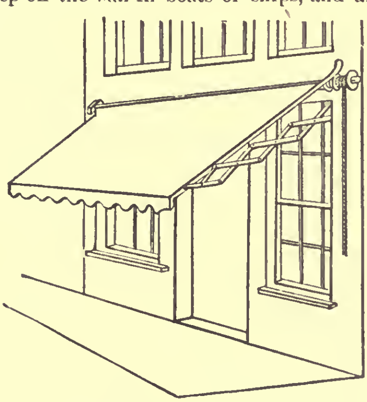


Fig. 21.—Awning.

shade store-fronts. The ordinary mode of supporting a roll of canvas, by means of rafters resting against the building and upon posts at the curb, need hardly be described. The canvas is tacked to a roller, and is furled by means of a running rope, being protected, when furled, by a pent-roof on the wall of the building. In Fig. 21, the lower edge of the *A.* is attached to the boards, which are secured to the side extension. The extensors are made in toggle-sections, operating as lazy tongs. The upper edge of the *A.* is coiled on a roller operated by a cord; it is held by a pawl, to keep the canvas stretched. The spiral spring acts to keep the arm extended. So far as ingenuity has been exercised upon this subject, it has generally been upon modes of lowering and winding, having especial reference to shading sidewalks and show-windows. Some devices, however, have been intended for window-shades, and are modified in shape and mode of operation to suit their location.

Axayacatl, the eggs of a species of fly deposited on rush mats, and sold as caviare in Mexico.

Axe, an iron instrument generally used with both hands in hewing timber and chopping wood. It consists of a head with an arching edge, and a handle. There are several forms of *A.*, the two principal being the *broad A.*, for hewing, and the *narrow A.*, for cutting and rough-hewing. The *hatchet* is a smaller form of the *A.*, and is used with one hand. *A.* are now manuf. at very reduced prices in the U. States, principally at Cohoes, N. Y., Collinsville, Conn., etc. *Axe-handles*, usually made of the wood of the white hickory, and sold by the dozen, are also extensively manuf. in the Northern and Western States.

Axe-Stone. See Jade.

Axle, in wheel-work, is the shaft or pole on which the wheel turns. In strictness, it is the same thing as axis; but the *axle* and *axle-tree* of a wheeled vehicle are rather elaborate contrivances to insure the smooth rolling of the wheel along the road, and the avoidance of heat at the rolling surface.

Axminster Carpet, an imitation Turkey carpet, noted for its thick and soft pile; the worsted being thrown entirely to the surface, instead of appearing on both sides. These carpets are woven in one piece, usually 27 inches wide.

Axonge. See Lard.

Ayr-Stone. See Snake-Stone.

Azaleine. See Aniline (Red).

Azimuth, a nautical instrument for finding the sun's magnetical azimuth.

Azores, or Western Islands, are situated in the Atlantic, between lat. 37° and 40° N., and lon. 27° and 32° W., about 795 m. W. of Portugal, to whom they belong. They consist of 3 groups, viz.: 1. St. Michael's and St. Mary; 2. Terceira, Fayal, Pico, St. George, and Graciosa; 3. Flores and Corvo, exclusive of several islets. *Pop.* 252,480. The seat of government is Angra, in the island of Terceira. *Pop.* 20,000.

These islands are of volcanic origin, and are in general mountainous. The climate is mild and pure, and the soil highly fertile, most of the islands abounding in vineyards, orange and lemon orchards, and pastures. The growth of wine is considerable. It is produced mostly in Pico, but is known as *Fayal wine*, from being shipped from the latter. From 8,000 to 10,000 pipes are exported in favorable seasons to America and the West Indies. Large quantities of fruit are exported to England. The imports from America are boards, staves, lumber, fish, pitch, tar, mineral oil, wheat, tobacco, etc. The principal shipping towns are Ponta del Gado in St. Michael's, Angra in Terceira, and Fayal in the island of the same name: but there is no good port, and as none of the anchorages afford shelter, ships are often obliged, by violent winds, to put to sea at a very short notice. The commerce of the U. States with the *A.* for the year 1878 (including Madeira and the Cape Verde Islands), was as follows: Imports, $73,076; exports, $645,108. Ships entered, 30; tonnage, 9,492; ships cleared, 45; tonnage, 14,178.

Azure, a pale but clear and brilliant blue color.

Azure-Stone. See Lapis-Lazuli.

Azurine. See Aniline (Blue and Green).

B

Bablah, Babula, or Neb-Neb, is the rind of the fruit of the *Mimosa cineraria*. It contains a considerable portion of gallic acid; also tannin, a red coloring matter, and an azotized substance. It is imported from the East Indies and from Senegal, as a substitute for the more expensive astringent dye-stuffs, and for communicating shades of drab to cotton.

Babouche, a Turkish slipper.

Back, a large vat or cask used in breweries and distilleries to hold beer, spirits, or water, of from 300 to 500 gallons capacity. They have been made so large as to hold 1200 barrels. In many breweries, a back is simply a very large flat tub used to cool wort.

Backgammon-Board, a board or table with two divisions or folding leaves to hold the men, dice, and boxes used for playing the game of backgammon on certain black and white spaces called points. It is generally made to imitate the exterior of a bound book.

Backing, in bookbinding, preparing the back of a book for gluing, etc., for receiving the cover or case.

Back-Rag, a Dutch wine.

Backs, the thickest and stoutest tanned hides, used chiefly for sole leathers.

Backwardation, an English stock-exchange term for an allowance made for carrying over stock, shares, etc., to the next account-day, instead of settling or delivering at once.

Back-Woodsman, a settler in the uncleared districts of North America.

Bacon. See Ham.

Badana, the Spanish name for a dressed sheep's skin.

Baden, a Grand-duchy of Germany, situated on the right bank of the Rhine, between lat. 47° and 50° N. and lon. 7° and 10° E. *Area*, 5,851 sq. m. *Pop.* 1,507,179. Principal cities: Mannheim, *pop.* 46,452; Karlsruhe, the capital, 42,895; and Pforzheim, a manufacturing place, 23,692.

Baden has been called the "Eden of Germany," for although nearly one-half of its surface is occupied by the mountainous districts of the Black Forest and the Odenwald, it possesses a soil favorable for the growth of corn, wine, and fruit, and abounds in magnificent woods and navigable streams, while the proportion of waste land to the whole soil is less than six acres in every thousand. Agriculture is the chief occupation of the people. Grain, tobacco, hemp of a very fine description, and flax are extensively cultivated. The average product of the vine, which is chiefly grown on the high lands skirting the valleys of the Rhine and Maine, and Lake Constance, is estimated at about 4,000,000 gallons. The chief mineral productions are silver, cobalt, copper, iron, manganese, salt, coal, alum, vitriol, and sulphur. The most extensive manufacture is perhaps that of the middling and coarse descriptions of linen; the chief others are woollens, cottons, silks, watches, jewelry, paper, and wooden-ware, clocks, and straw hats, for the production of which the Black Forest has been long celebrated. Baden is advantageously situated for trade from its position on the Rhine, Maine, Neckar, and other streams, which, besides securing for it an outlet for its own productions in the Empire, and in Switzerland, have rendered it a country of extensive transit. — *Finances:* The public debt is divided into two parts, the first called the general debt, amounting in 1878 to 85,269,414 marks, or $21,317,350; and the second the railway debt, amounting to 251,330,028 marks, or $62,832,505. Nearly the whole of the debt bears interest at the rate of five per cent. — *Measures, Weights, and Money*, see Germany.

Badger, a carnivorous quadruped (*Meles vulgaris*), approaching the bear in character (Fig. 22). It is about the size of a fox, is found in Europe and in some parts of the U. States, and is hunted by night, chiefly for its hair, which is made into shaving- and paint-brushes. Its skin dressed with the hair on is sometimes used for trunks, and the hide makes good pistol furniture.— The name *B.* is also applied to a ticket poster, one entitled to wear a badge; and to a licensed carrier.

Fig. 22. — Badger.

Badiane. See Star-Anise.

Badigeon, the French name for whitewash; also a composition of saw-dust and glue, used by joiners to fill up chinks in wood; a colorless substance or thick mortar for hiding defects in stone work.

Baetas, a plain, unchecked woollen stuff, manufactured in Spain and Portugal.

Bag, a canvas sack or enclosed wrapper intended to contain grain or any other description of dry merchandise. There is no certain defined quantity that a bag shall commercially hold, the weight necessarily varying with the contents, which range from 1 to 2½ cwt. Grain-bags of American manuf., which are hired out for a voyage to Europe, and returned empty, or which are exported empty, and afterwards imported filled with grain, are admitted free of duty. See Bale and Sack.

Bagatelle-Board, a cloth-covered board pierced with 21 holes, for playing a game with a set of 9 ivory balls.

Bagazo, the mass or refuse of grapes, sugar-canes, etc., after they have been pressed.

Baggage. See Passenger.

Bagging, a coarse kind of stuff, made of hemp, jute, old ropes, cotton, etc., and used as a wrapper for wool, cotton, coffee, grain, and other articles. It was chiefly imported from Dundee, but is now extensively manuf. in the U. States. The *B.* made of hemp is known as Kentucky *B.* *Imp.* duty, 40 per cent. See Gunny-Cloth.

Bagpipe, a musical instrument of very ancient origin, consisting (Fig. 23) of two parts, viz.: a leathern bag and three pipes. The bag of the Irish pipes is inflated by a bellows, that of the Scotch pipes by the mouth; and each is compressed with the arm, so as to sound the pipes.

Bahama Islands. See West Indies.

Bahama Sponge, a coarse kind of sponge, fished up about the Bahama Islands, used for common purposes.

Bahia. See Brazil.

Bahut [Fr.], a coffer or large chest in the Renaissance style.

Baies, the French name for berries.

Bail, one who stands bondsman or security for the appearance of another in a court of law under certain penalties.

Bailleur de Fonds, in France, one who furnishes capital for a business; a silent partner.

Bailment. This term, peculiar to English law, not generally used in America, is applied to a delivery of goods by a party called *bailor* to another party called *bailee*, on a condition, expressed or implied, that they shall be restored by the bailee to the bailor, or according to his discretion, as soon as the purpose for which they have been bailed shall be answered. It embraces a variety of contracts, which, when they have relation to commerce, will be found treated under their respective designations.

Bait, food for horse, hence the term "livery and bait stables." More generally, a bit of food or other substance put on a hook to entice fish.

Bait-Mill, a machine used by fishermen for cutting mackerel or salted herrings into small pieces for bait. It consists of an oblong wooden box, standing on one end, containing a roller armed with knives, which is turned by a crank on the outside.

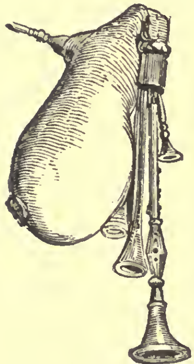


Fig. 23.—Bagpipe.

Baize, a coarse, open woollen fabric, having a long nap, and sometimes friezed on one side. It is imported from Rochdale, England; also manuf. in the U. States.

Baking-Powders, are preparations of chemical salts, soda, phosphates, etc., used as substitutes for yeast in making bread.

Balachong, a preparation consisting of small fish with prawns and shrimps, first fermented and then dried. It is esteemed a great delicacy by the Malays and Chinese, with whom it forms an article of extensive commerce.

Balance, in *Book-keeping*, the sum of money which must be added to one or the other side of an account, in order that the debits and credits may be *balanced*, or of equal amount.

B., or *Beam and Scales*, is a well-known instrument used for weighing commodities. In manufs., delicacy of weighing is seldom so much needed as in science. An ounce of pins, a pound of silk, a ton of iron, may be weighed with sufficient accuracy for commercial purposes by the common *B.* or pair of scales. Generally, a *B.* (Fig. 24) has two scales or pans, in one of which weights are placed to counterbalance the commodity placed in the other; and all *delicate B.* are of this form, such as those which will turn with *one-millionth* part of a load. In all such *B.* the pivots are exquisitely constructed, very often steel knife-edges resting on agate. Common scales have a single scale-pan, with a movable weighted lever as a counterbalance. Other forms of *B.* are noticed under Spring-Balance, Steelyard, and Weighing Machine.

Balance-Book, is a book in which the adjusted accounts of debtors and creditors have been posted from the ledger.

Balance of Trade, is the difference between the commercial exports and imports of any country. A State is said to have a *favorable B.* when the exports exceed the imports, and an *unfavorable B.* in the contrary case; it being supposed that such balances could not be cancelled, except by the remittance of an equivalent amount of gold and silver, and that the money thus remitted is the measure of the gain or loss derived by the State from foreign trade. In order chiefly to bring about the desirable result of a favorable balance, restrictions and prohibitions were for many years imposed in England, France, and other European countries on the importation of nearly all commodities except bullion, while on the other hand bounties were granted on exportations. The selfish principle that what is gained by one nation is lost by another, has been abandoned by England and France, but is still to this day the doctrine of American protectionists. It is obvious that the wealth of States and of individuals consists not in money alone, but in the abundance of their whole dispensable products; that gold and silver are commodities subject to the same general rules in their transmission, as sugar, tobacco, or any other commodities, namely, sent from where they are of lower to where they are of higher

Fig. 24.— Balance.

value, and never exported except for the purpose of importing some more valuable article in return; that in the case of what is called an unfavorable balance, bullion is not exported unless it be at the time the cheapest exportable commodity; and that in point of fact its exportation (except from mining-places), as well as its importation, can take place only to a limited extent. If bullion is largely exported, it will become scarce, and of course dear, in the exporting country; the money value of other commodities will in proportionate degree fall; and they will become preferable objects of remittance and exportation until bullion is again reimported. In a similar manner, if, by the operation of a favorable balance, bullion is imported in greater quantity than is necessary to supply the wants of the country, its value will become depreciated in relation to other commodities, and it will be again re-exported. The domestic exports of the U. States for the year 1878 amounted to $722,811,815, while for the same year the imports were only $466,872,846; America had therefore a very *favorable* balance of trade. But if we come to analyze the exports, we find that

about $600,000,000 consisted of natural products of the country, as cotton, bread-stuffs, mineral oil, tobacco, precious metals, etc., leaving a comparatively small balance for manufactured goods, while the considerable diminution on imports is certainly in part attributable to the high rate of protectionist duties, which in many cases amount to total prohibition, and year by year discourage European manufacturers from dealing with America. See PROTECTION AND FREE TRADE.

Balance-Sheet, is a statement of a trader's position or pecuniary affairs, showing the balances of property and debts, profits and losses.

Balancing-Books, in *Book-keeping*, the closing or adjusting of each personal or general account in the ledger, and clearing up a trader's or banker's books.

Balas Ruby, a lapidary's term for the rose-red varieties of spinel.

Bale, a package or bundle of goods in a cloth or skin cover, and corded for transportation; a package of merchandise of variable dimensions. Cotton, wool, and various other articles are shipped in *B.* The established *B.* of cotton in Alabama, Louisiana, and Mississippi is 500 lbs.; in Georgia, 375 lbs.; and in South Carolina, 362½ lbs.; in Egypt, 228 lbs.; Surat, 382 lbs.; Bengal, 300 lbs.; Brazil, 162 lbs. Practically, however, in packing cotton, these weights are only approximate. The average weight of the *B.* of all kinds of cotton arriving at Liverpool is about 400 lbs.—*McElrath.*

Baleen. See WHALEBONE.

Baleinier, the French name for a whaler.

Bale-Lashings, packing-cordage, usually sold in lengths of 17 fathoms. Hoop-iron, now generally used for cotton *B.*, is imported in lengths of about 12 feet.

Baling-Paper, a stout wrapping- or packing-paper for parcels.

Balize, or BALISE, is a timber frame or pole raised on a bank as a landmark; a buoy, or sea-beacon.

Balk, in the timber trade, a log of squared timber which varies in length from 20 to 90 feet, and from 8 to 30 inches in square.

Ball, a shot; a round plaything; a printer's inking-pad, etc.

Ballast, [Du. and Ger. *ballast;* Fr. *lest;* It. *savorra;* Sp. *lastre;* Por. *lastro,*] is sand, iron, or any other heavy material employed for sinking a vessel to a proper depth in the water, and to give it a just counterpoise against the action of the wind on the sails. In ballasting a vessel, the centre of gravity should be placed neither too high nor too low. When too much heavy *B.* is deposited in the bottom of the hold, the vessel will be too *stiff;* she will roll violently, and besides having her sailing qualities impaired, will be in danger in bad weather of being dismasted. When, on the contrary, there is too little *B.*, or this is so disposed as to raise the centre of gravity too high, the vessel will be too *crank*, and equal danger will arise. The art of ballasting, however, is to be acquired rather from experience than specific rules, as the quantity required by different vessels of the same tonnage varies according to their shape or *build.*

Vessels in *B.*, *i. e.*, having no goods on board other than the stores and other articles requisite for the ship, crew, and passengers, are exempt from the payment of certain port-charges which are levied upon vessels having cargoes; many formalities at the custom-house are likewise dispensed with in favor of such vessels.

Ballast-Engine, a steam-engine for dredging up shingle in a river, or drawing gravel or earth on a railroad.

Ballasting, a term for gravel, stone, clay, or other material applied to the covering of roads generally, but to the metalling or bottoming of railroads in particular.

Balling-Furnace, an oven in which iron is heated to a welding heat.

Ballistic-Pendulum, a mechanical contrivance for ascertaining the strength of gunpowder, by computing the velocity of a cannon-ball, which is made to strike a revolving or swinging beam.

Ball Leathers, the outer skin-covering of the pads nailed to the ball-stocks used by printers for inking type.

Balloon, [Fr. and Ger. *ballon,*] a machine made of silk, inflated with coal-gas for aërostation (Fig. 25). The ascent of a *B.* in the air is simple enough in principle. If the capacity of a hollow globe of silk is 10,000 cubic feet, and if 10,000 cubic feet of atmospheric air weigh more than the same quantity of gas or of heated air, *plus* the apparatus, then the *B.* and its appendages will ascend. The time has not yet arrived when the *B.* can be ranked among the aids to locomotion; for, although movement can be easily obtained, the maintenance of a particular *direction* still baffles the aëronaut.

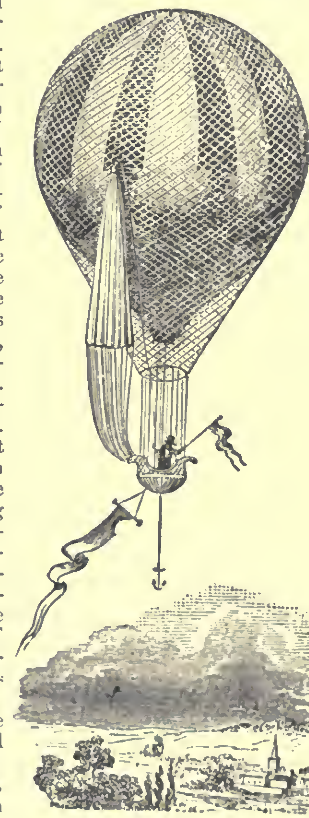


Fig. 25.—BALLOON.

Balm. See BALSAM and MELISSA.

Balmorals, [so called from the country residence of Queen Victoria in Scotland,] a heavy and bright colored skirting of woollen or worsted, wholly made of wool or mixed with cotton, imitating the skirt worn by the Swiss peasants, and largely manuf. in the U. States. *Imp.* duty, 35 per cent., besides a duty of 20 cents per lb. when value is not over 40 cents per lb.; 30 cents when value is from 41 to 60; 40 cents when value is from 61 to 80; and 50 cents when value is above 80 cents. *B.* manuf. in whole or in part, pay 50 cents per lb. and 40 per cent.

Balot, [Fr. *ballot,*] a small bundle or package.

Balsa, a raft or float of skins, used principally on the Pacific coasts of S. America, for landing goods through a heavy surf.

Balsam, [Fr. *baume;* Ger. *balsam,*] a name ap-

plied to various medicinal resinous juices obtained from trees; but the term is strictly applicable only to such as contain benzoic acid, along with a volatile oil and resin; and of these true *B.*, there appears to be only five, namely, *B.* of Peru, *B.* of Tolu, Benzoin, Storax, and Liquid Amber. There are besides the *B.*, or Balm of Gilead or Opobalsam, Copaiba, and others which contain no benzoic acid, but are turpentines containing a volatile oil and resin.

B. of Peru is procured from a tropical American tree (*Myroxylon Peruiferum*). It occurs in two states; the white and the black. The former, which results from spontaneous exudation, or incisions made in the bark, is very rare. The black or common *B.* is said to be procured by boiling the bark and branches of the tree. It is a fluid, having the consistence of syrup, a brown color, fragrant aromatic smell, and a pungent bitterish flavor. Sp. gr. 1·15. It is commonly imported in tin flasks. Average price in New York, $1.20 per lb. *Imp.* free. Both the white and black *B.* are extensively adulterated, chiefly with copaiba, turpentines, or volatile oils.

B. of Tolu, or *Dry White B.*, is said to flow from incisions in the same tree; and when fresh is of the consistence of a strong turpentine. It becomes tenacious with age, and in cold weather may be broken, but melts again in summer. It is a brownish-yellow or reddish-brown friable substance, of a pleasant smell like benzoin, and a weak, aromatic, somewhat acrid taste. Largely used in pharmacy and perfumery.. Its adulteration with turpentine or resin is known by its odor when thrown on hot coals. It is imported in jars or tin cases. Average price in New York, $1.00 per lb. *Imp.* free.

Baltimore, a magnificent city of the U. States, the commercial metropolis of the State of Maryland, and one of the three great seaports of the East, lies in lat. 39° 17′ N., lon. 76° 38′ W., on the Patapsco River, 18 m. (to the wharves) from its entrance into the Chesapeake Bay. The bay is sufficiently roomy, and of a depth to accommodate the largest ships, and the channels in the river, which are being continually improved, have been dredged to 24 feet, and a width varying from 250 to 400 feet. "Situated at the most northerly navigable extremity of the Chesapeake Bay, into which a number of rivers discharge themselves, passing through in their progress the most fertile districts of Virginia and Maryland, the city of *B.* is most favorably placed. Within the bay she has water communication by canal with New York and Philadelphia; with Washington by the Potomac River, and thence by the Chesapeake and Ohio Canal with Cumberland, the colliery district of the State. With Richmond, Petersburg, and Lynchburg, the James River affords means of communication, and with Norfolk the broad waters of the bay. Along these coasts and water-sheds, thousands of acres of well-tilled farms and numberless thriving villages are situated, dispatching the best qualities of grain grown upon the continent to her wharves, to the extent, at times, of 100,000 bushels in a day, in almost numberless craft — steamers, schooners, and sloops — in exchange for supplies carried upon return voyages. The position of *B.* at the head of the Chesapeake, brings it much nearer to the interior of the country than the other large cities of the Atlantic coast. The advantages of this are two-fold: First, conveying freight further by water causes a corresponding reduction in the cost of transportation; and secondly, its proximity to the coal region, and direct communication with them, enables steamers to take in coal at about $2.50 per ton less than they could do at New York, giving a direct saving of $2,000 upon the 800 tons consumed by steamers in each voyage across the Atlantic. With these advantages in point of location, *B.* is naturally becoming an outlet for the productions of the great West, as well as the interior, at the same time being a natural distributing point to the same sections of the country. *B.* is the seaport terminus for three lines of railroad. These are the *B.* and Ohio, Northern Central, and *B.* and Potomac, all of which run to important sections of the country. Steamers ply between *B.* and Boston, New York, Philadelphia, Richmond, Norfolk, Wilmington, and New Berne, N. C., Charleston, Savannah, Key West, New Orleans, Havana, Galveston, etc. *B.* has also great European steamship facilities. From the large and commodious piers of the Baltimore and Ohio Railroad Co., at Locust Point, the *Allan line* dispatches six large steamers a month to Liverpool, the *North German Lloyds* two regularly per month to Bremen, the West India and Pacific S. S. Co. one a month to Liverpool and another to Havre, and on March 1, 1879, the *N. C. Railway Co.* started a weekly line to Liverpool. Two lines of Spanish steamers send out about four boats per month, and numerous steamers of no particular lines send out full cargoes. In addition there are now building six iron steamers to run between *B.* and Barrow, England, which are chiefly designed for the live-stock trade, and will be operated in connection with the traffic of the *B.* and Ohio R.R. Co. In 1878 the marine of *B.* consisted of 1,776 vessels — tonnage 129,-936·67. During the same year 1,074 foreign ships, 334 American ships engaged in the foreign trade, and 113 foreign ocean steamers, having an aggregate tonnage of 1,227,131, entered the port, which was 8·25 per cent. of the total tonnage entered at American seaports from foreign countries. The exports were $19,512,468 (4·57 per cent. of total imports of the U. States) in 1870, and $16,938,628 (3·81 per cent. of total imports) in 1878. The exports were $14,330,248 (2·97 per cent. of total exports of the U. States) in 1870, and $45,492,527 (6·54 per. cent. of total exports) in 1878. *B.* has 14 national banks, with an aggregate capital of $10,418,985, and there are besides several important private banking-houses. The rapid increase of its commerce may be inferred from the following review of her leading products, exports, and imports in 1878. *Pop.* about 325,000.

Canned Oysters, Fruits, and Vegetables. *B.* is the great oyster mart of the world (see OYSTERS, under which head is given a synopsis of that important branch of the *B.* trade). There are 41 large establishments exclusively engaged in packing, and perhaps 100 small ones which are chiefly employed in opening oysters for home and near-by consumption. About 10,000 men are employed in packing and handling. As an exhibit of the amount done, 50,000 cans of raw oysters are put up daily by a single house, and 30,000 cans of cooked by another. The principal markets for foreign trade are in England, Australia, S. America, and the West Indies.—When the canning of oysters is finished, each year, that of fruit and vegetables begin. From 4 to 5 millions of cans of peaches, tomatoes, and corn; from 8 to 10 millions of fruits; and from 6 to 10 millions of cans of vegetables are packed annually. These canned fruits and vegetables are sent to all parts of the U. States, and are exported to all sections of the civilized world. The Hindoo, Chinese, Japanese, and all European markets, are largely supplied with canned goods from the packing-houses in *B.*

Coal. The inexhaustible supplies of bituminous coal furnished from the Cumberland coal region, the superior quality of the article, the gas-coal from W. Virginia, and the anthracite coal brought to the city from the coal regions of Pennsylvania, all point to *B.* as the centre for that trade. In 1870 coal was seldom shipped from *B.* to any foreign port except to Aspinwall. Since that time Cumberland coal has grown rapidly into favor, and about 40,000 tons were exported in 1878.

Coffee. *B.* stands only second to New York for the coffee trade. Its imports from Brazil, in 1878, amounted to 481,184 bags, and the average monthly sales to 40,912 bags.

Cotton. The foreign export of raw cotton, in 1878, was 83,295 bales, against 37,097 bales in 1877. There are 17 mills engaged in the manuf. of cotton (shirtings, sheetings, and cotton duck), and 80 per cent. of all the cotton duck pro-

duced on the earth is made by these mills. An extensive trade is done with foreign countries by the *B.* manuf., who have generally agents in England, France, and Germany.

Flour. *B.* is one of the greatest flour markets in the world. The flour manuf. in this city from the high grade and fancy Maryland and Virginia wheat, is of well-known superior quality, and wherever introduced maintains its reputation. A very high grade of "strong flour" is manuf. with great care for shipment to Brazil and other S. American countries. This flour is capable of standing long voyages to the tropics. In 1878, *B.* received 1,594,113 bbls., against 1,322,709 bbls. in 1877. The export trade for the years 1876–1878 was as follows:

Destination.		1878.	1877.	1876.
Great Britain	bbls.	100,353	39,158	51,032
Bremen	"	1,118	58	1,046
Holland	"	200	53	300
Brazil	"	363,796	255,310	266,341
River la Plata	"	....	....	500
Br. N. Am. Colonies	"	1,905	1,829	2,778
West Indies	"	115,070	72,681	101,704
Other ports	"	7,708	430	1,393
Totals		590,150	369,519	426,094

Grain. The completion of the *B.* and Ohio R.R., the extension of its western connections, and the facilities granted by the Pennsylvania R.R., have caused a large increase of the long-famed grain trade of *B.* The comparative receipts of grain for three years were as follows:

		1878.	1877.	1876.
Wheat	bbls.	22,017,120	7,331,540	3,945,247
Corn	"	17,907,108	21,142,399	24,684,230
Oats	"	1,052,046	831,179	810,212
Rye	"	59,631	116,709	112,160
Peas	"	25,000	20,000	15,000
Beans	"	60,000	55,000	50,000
Totals	"	41,120,905	29,496,827	29,616,849

Foreign Exports of Wheat and Corn for Nine Years.

Year.		Wheat.	Corn.	Totals.
1878	bbls.	19,610,791	16,953,458	36,564,249
1877	"	4,514,781	19,353,047	23,867,828
1876	"	1,659,861	20,953,724	22,613,585
1875	"	2,046,430	6,989,607	9,036,037
1874	"	3,556,848	5,959,757	9,516,605
1873	"	1,158,097	6,093,618	7,251,725
1872	"	88,025	5,157,235	5,245,261
1871	"	996,140	2,800,861	3,897,901

Live-Stock. The cattle-market of *B.* has long been famous. The market is furnished from Virginia, W. Virginia, Pennsylvania, Tennessee, Kentucky, Missouri, Illinois, Texas, N. Carolina, Indiana, and Ohio. The aggregate receipts of beef-cattle for 1878 (including only cattle offered for sale at the stock-yards) were 117,675, on which foreign export took 2,989 head, the beginning of a large trade anticipated. Total receipts of live hogs for 1878 were 360,514 head, being 40,855 more than 1877, and 113,052 more than 1876.

Lumber. This trade is very extensive. Altogether about 35 large houses are engaged in the lumber business, with an immense aggregate capital, and the machinery used in the trade is of the most highly improved character. About 50 millions of feet of yellow pine are used annually in making packing-boxes only. The export trade in 1878 was 2,818,052 feet, against 2,607,000 in 1877.

Metals and Machinery. *B.* is surrounded by iron-ore beds, and though the iron trade has declined during the last few years, mining is still carried on to some extent even within the city limits. For many years the largest iron plates rolled in America were made at the Abbott Iron Works of *B.* There is one railroad iron mill capable of turning out over 40,000 tons finished rails yearly. There is also large business done in the manuf. of marine and stationary steam-engines, water-wheels, mill-gearing, shafting, pulleys, stoves, hollow-ware, iron work for buildings, plumbers' iron and brass goods, agricultural implements, car-wheels, etc. The copper industry stands at least equal to any on the Atlantic coast.

Petroleum. *B.* is the nearest seaport to the oil regions, and has exceptional facilities for refining petroleum. There are 7 large refineries, besides 2 for gasoline and 2 for paraffine. The aggregate receipts of refined and crude oils in 1878 were 879,605 bbls., against 1,094,952 bbls. in 1877. The total exports during the same year were 37,717,056 gallons.

Provisions. Large quantities of provisions from the West to foreign ports are shipped at *B.*, and the preparation and exportation of lard has become one of the most important departments of commerce. There are 6 large establishments engaged in refining lard for export, besides numerous small ones for home trade. The *B.* refined lard is of very high standard, and is celebrated everywhere. The exports of provisions from *B.* in 1878 (and totals for preceding years) were as follows:

To	Lard. lbs.	Bacon. lbs.	Pork. bbls.	Beef. bbls.
Great Britain	3,880,370	11,683,437	....	375
Germany	12,229,850	2,893,959	50	628
Holland	168,569	....	....	228
Brazil	4,162,912	1,316	5	6
British Guiana	340,968	33,422	5,020	719
West Indies	479,955	133,955	3,252	787
Br. North Amer. Col.	....	362	10	....
Totals 1878	21,262,610	14,746,451	8,337	2,943
Totals 1877	12,348,851	8,452,239	7,511	4,741
Totals 1876	12,268,709	5,482,000	14,874	3,321
Totals 1875	8,520,000	1,130,210	17,864	3,127

Shoe and Leather. This branch of *B.* industry is of considerable and daily-increasing importance. In 1870, the *B.* Shoe and Leather Board of Trade was established. In 1878, there was exported to England and Germany about 15,000 sides of oak-tanned leather. The amount of oak and hemlock leather received during the same year was 650,000 sides, value $3,250,000; the light stock, calf-skins, upper and finished stock of all kinds, $2,500,000; green, salted and dry flint hides, 375,000, valued at $1,875,000. The estimate value of all business made in hides, leather, and skins of all descriptions in 1878 was $5,375,000. There are 29 firms engaged in the manuf. of boots and shoes, employing about 4,000 operatives. The sales for 1878 were as follows: Wholesalers and retailers, $8,000,000; manufacturers, $6,000,000; rubber boots and shoes, $1,000,000; auction sales, $1,000,000; hides and leather, $5,000,000; making a total of $21,000,000.

Sugar. The total imports and consumption at *B.* for years 1874–1878 were as follows:

Year.		Imports.	Consumption.
1878	tons.	23,803	22,787
1877	"	37,794	40,187
1876	"	24,456	25,150
1875	"	64,690	66,766
1874	"	70,262	71,344

The imports of molasses of all kinds for years 1876–1878 were as follows:

		1878.	1877.	1876.
From Cuba	hhds.	23,272	16,495	12,934
Porto Rico	"	580	808	2,442
East Indies	"	1,246	1,889	1,473
French Islands	"	61	....	....
New Orleans	"	1,078	489	452
Totals		26,237	19,681	17,301

Baltimore and Ohio R.R. (offices at Baltimore). This Co., one of the most important, best managed, and most successful in the world, was first chartered in 1827. Its main line, from Baltimore, Md., to Wheeling, Va., a distance of 379 m., was completed in 1853. On Jan. 1, 1879, the Co., with all its branches and leased lines, had in operation 1,499·75 miles of road. The B. and O. R.R., having now a continuous line of railway from Baltimore to Chicago, and connecting with all the great railroads which pass through States bordering on the Mississippi, is enabled to compete with the great lines of New York and Boston for a share in the transportation of grain and other products of the North-western States. It has at Baltimore spacious and substantial warehouses and grain-elevators; and in its great workshops at Mount Clare, on the western suburbs of Baltimore, are manufactured all the varieties of work required by the necessities of a mammoth railway. On Sept. 30, 1878, the financial status of the Co. was as follows:

LIABILITIES.

Stock	$13,677,730.00
Preferred stock (dividends limits at 6 per cent.).	4,599,578.72
Surplus fund (invested cap. derived from net earnings)	37,111,919.29
On loan 1850–1880, int. 6 per cent. (Jan. and July).	579,500.00
On loan 1853–1885, int. 6 per cent. (April and Oct.).	1,710,000.00
On Baltimore city loan, 1855–1890, int. 6 per cent. (Jan., April, July, Oct.)	2,938,091.09
On Sterling loan 1870–1895, int. 6 per cent. (March and Sept.)	3,017,697.00

On Sterling loan 1872–1902, int. 6 per cent. (March and Sept.)	$8,683,686.35
On Sterling loan 1874–1910, int. 6 per cent. (May and Nov.)	9,232,341.90
On Sterling loan 1877–1927, int. 5 per cent. (June and Dec.)	7,703,032.24
On bond to city of Baltimore, 1875–1900, int. 6 per cent. (Jan. and July)	880,000.00
Sterling debentures due in 1880 and 1881	2,420,000.00
Bonds to State of Maryland due 1888	366,000.00
Bonds of the N. W. Va. R.R. guaranteed, 3d mortgage, 1855–1885, int. 6 per cent. (Jan. and July).	140,000.00
Loans and Sterling obligations	2,554,959.33
Bills payable	2,563,302.29
Unclaimed dues	87,134.89
Washington branch road	114,331.96
	$98,379,307.06

Assets.	
Cost of road	$29,498,965.19
Rolling power	12,116,258.46
Real estate, etc	8,543,611.45
Stocks, bonds, and loans	45,627,644.64
Uncollected revenue	485,291 60
Materials on hand	538,558.02
Bills receivable	1,496,937.79
Balance on hand in the treasury	72,039.91
	$98,379,307.06

Rolling stock on main line and branches: Locomotive engines, 560; cars in passenger trains, 553, and in freight trains 12,072; total, 12,625.

Net earnings for 1878, $5,995,978.63.

Dividends paid on cap. stock: Nov. 15, 1877, 3 per cent.; May 15, 1878, 4 per cent.

Baltimore and Potomac R.R., extends from Baltimore to Pope's Creek, Md., a distance of 73·1 m., with branch from Bowie station to Washington City, 17·1 m.; total, 90·2 m. Office in Baltimore. This road, partly opened in 1872 and completed in 1873, forms, in connection with the Northern Central R.R. of Baltimore, a continuation of the Pennsylvania R.R. system to the Southern R.Rs., through Washington. The first mortgage bonds of this Co. are jointly guaranteed by the Pennsylvania R.R. and the Northern Central R.R., and its capital stock mostly owned by these companies. *Financial Statement*, 31st Dec. 1878: Funded debt, 1st mortgage main line bonds, issued 1871, $3,000,000, payable 1911, interest 6% (April and Oct.); 1st mortgage tunnel bonds, issued 1871, $1,500,000, payable 1911, interest 6% (Jan. and July); 2d mortgage income bonds, issued 1875, $2,000,000, payable 1915, interest 6% (Jan. and July). Net earnings, 1878, $92,890.26. Payments, interest on bonds, and others, $275,171.76. Balance deficit, $182,260.65.

Bamboo, a gigantic plant of the reed or grass kind, which grows luxuriantly in the tropical parts of America and Asia. It shoots up with great rapidity, and varies in height from 15 to nearly 100 feet. When full grown its general appearance is that of a straight rod with a number of stiff branches shooting at right angles from the main stem. It is of almost universal use, and is probably the most valuable boon conferred by Nature upon the inhabitants of warm climates. The young shoots of the plant are eaten as asparagus; when older, a fluid affording an agreeable beverage is secreted in the hollow joints; and the leaves and seed are used in medicine. It is largely imported into this country, where it is used for a variety of purposes, as walking-sticks, umbrella-sticks, chair-seats, wicker-work, tobacco-pipes, etc. *Imp.* free; when manufac., 35 per cent.

Ban, the Spanish name for a kind of fine muslin.

Banana, the fruit of the *Musa paradisiaca*, a valuable plant common in tropical countries. It very closely resembles the plantain, but is generally shorter and rounder, with a pulp softer and of a more delicate taste. It grows in clusters, and the bunches vary in size, containing from 8 to 100 *B.*, and weighing from 4 to 40 lbs.

The *B.* and plantain are to the inhabitants of the torrid zone what maize is to this country, wheat to Europe, and rice to India and China. There is perhaps no other plant in the globe which, in so small a space of ground, can produce so great an amount of nutriment. The produce of the *B.* is said to be to that of wheat as 133 : 1, and to that of potatoes as 44 : 1. Numerous preparations are made of this fruit, both before and after its maturity. When fully ripe, it is exposed to the sun, and preserved like figs, forming an agreeable and wholesome food; while meal or flour is obtained from it by being cut into slices, dried, and pounded. The clusters are imported to the Northern States from the West Indies and Florida, in the green state, but the fruit rapidly ripens and decays. *Imp.* duty, 10 per cent.

Banasta, in Spain, a large basket made of twigs or laths.

Bancal, an Indian weight of about 17 drachms avoirdupois; also the Spanish name for a thrown or twisted carpet.

Banca-Tin. See Tin.

Banco, an Italian word signifying bank, used at Hamburg and other places as a prefix to paper money, and also for sums inscribed in the books of the bank opposite the names of those who have deposited money or specie there. Banco is worth on an average 23 per cent. more than ordinary currency; but the premium necessarily varies with the nature of the security.

Band, a tie; a waist-girdle; an ornament; a body of musicians; a weight used on some parts of the coast of W. Africa for weighing gold-dust, equal to about 2 ozs. Troy.

Bandage, a ligature; a linen roll or other support or protection for the limbs, sold by chemists and surgical instrument makers.

Bandal, or Bandle, a linear or cloth measure used in the S. and W. parts of Ireland, which is rather more than half a yard.

Bandala. See Manilla Hemp.

Bandana, a kind of handkerchief with white figures or spots upon a red or dark ground, manuf. in England and Scotland, where the original Indian pattern has been much improved. To produce the figures or spots, holes of the proper size and shape are pierced in two metal plates, one affixed to the upper and the other to the lower part of a press. The cloth, previously dyed Turkey-red or some other color, is folded into 12, 16, or 20 thicknesses, placed in a compact pile between the two plates, and heavily pressed by them. A liquid solution of chlorine is made to flow over the upper plate; it passes into all the holes; finds its way through all the thicknesses of cloth; then escapes through the sides in the lower plate, and during the brief passage it extracts all the color. The pressure is so great (300 tons) that, under the influence of the skilful arrangement adopted, none of the liquid deviates sideways to act upon the other parts of the cloth. This is a variety of the *discharge* style adopted by calico-printers.

Bandbox, a thin box of slight wood, papered, chiefly used by milliners. Large quantities of them are annually made in New York and Philadelphia.

Bandeau [Fr.], a fillet, wreath, or veil; a lady's ornament for the head.

Bandoline, is an adhesive gum, made from Iceland moss, or from quince-seeds, steeped and boiled, and perfumed with essences. It is used by ladies for fixing or smoothing the hair.

Bangkok. See Siam.

Bangor and Piscataquis R.R., runs from Oldtown, Me., to Blanchard, Me., a distance of

62·5 m. Office at Bangor, Me. It was chartered in 1861, and opened to its present terminus in 1875. *Financial Statement:* Cap. stock, $357,148.50, of which $200,000 is held by the city of Bangor in exchange for bonds, and for which it has a mortgage on the road. Funded debt, city of Bangor bonds, as follows: $600,000 issued 1869, interest 6%; $322,000 issued 1871, interest 7%; $99,000 issued 1874, interest 7%; $101,000 issued 1876, interest 7%,—all payable 1 April, 1899. Net earnings for 1877, $24,834.79.

Banister-Brush, a domestic sweeping-brush for the stairs.

Banjo, a favorite musical instrument of the colored people in America. It has a head and a neck like the guitar, a body like a tambourine, and five strings, which are played with the fingers and hand.

Bank, a term sometimes applied to a depository for money, but most commonly to an establishment for dealing in money capital. The proprietor or manager of such an establishment is called a *banker*. See BANKING.

Bank-Fishery, the cod-fishery on the banks of Newfoundland.

Bank-Hours, the time within which money is paid or received at a banking-house, more usually between ten and three.

Banking, is a term generally used to express the rules and principles by which the operations of a bank or banking-house are, or should be, regulated, as well as these operations themselves. The issue of paper-money in the form of notes payable to the bearer on demand is, in reference to the public, perhaps the most important of the functions of a bank. This privilege is restricted in America to the NATIONAL BANKS, under which head is explained in this work the whole system of banking of the U. States. In each State of Europe it is granted to one public bank, which—Great Britain excepted—is generally more or less connected with the government. These public banks are noticed under the names of the countries to which they belong. The present article, therefore, is limited to general considerations on the principal purposes of both national banks and private banking-houses, namely, to receive deposits, to facilitate remittances, and to make loans.

Deposits.—The banks first instituted in Europe after the revival of commerce were established for the purpose of receiving deposits. The lodgements consisted of coin of full weight, or an equivalent amount of bullion; and the credits raised in the bank-books for such deposits were transferred in payment of debts from one account to another by means of drafts or checks; the coin or bullion being seldom or never withdrawn, except when required for exportation. No interest was allowed on the deposits; and the advantages derived from such banks consisted in the safe custody of the precious metals, in the facility and despatch given to cash transactions by the transfer system, and in the certainty afforded that these transactions would be adjusted in currency of a determinate and invariable standard, instead of the light and debased coins then in circulation. The receiving of deposits is now invariably conjoined with other departments of banking business, and the general condition of the circulating medium renders bullion lodgements unnecessary. Deposit banking, as thus modified, still furnishes to the public the advantages of secure custody for their money, with the facility, despatch, and economy of the transfer system; besides which, interest, varying from 2 to 3 per cent., is frequently allowed by private bankers on the sums in their hands, from the readiness with which they can be reinvested by the banks in securities yielding a higher rate. Deposits are of two kinds: *Dead accounts*, in which money is invested for the purposes of security and interest without being operated upon; and *Drawing accounts*, called also *Running, Operating*, or *Current accounts*, in which there is a perpetual paying in and drawing out by checks or otherwise, according to the circumstances or necessities of the depositor, interest being sometimes allowed on the daily balances in the hands of the bank.

Remittances were, in ancient times, effected by sending a messenger with the coin, and in the middle ages by means of bills of exchange. The latter still form the chief vehicle for foreign remittances. A common form of effecting an inland remittance is that of *Letter of Credit*, which authorizes the bank's correspondent to repay the money deposited with them to the party named in the letter; the use of the money during the intervening period, and sometimes a small commission, forming the remuneration of the bank. The transmission of money from one part of the country to another is now in great part effected in this country by the Express companies, and for small remittances, by Post-Office orders.

Loans may be classed under three heads: 1st, Discounts; 2d, Cash credits; 3d, Overdrafts on current accounts:

1. *Discounts.*—The form in which loans are chiefly made by bankers is on the security of bills of exchange or notes, which are well adapted for their purposes, as having only a short time to run before they fall due, the advanced capital soon returns, while, being transferable, they can, if necessary, be rediscounted. The advance is made to the full amount of the bill under deduction of interest, or, as it is loosely termed, *discount*, for the time which the bill has to run; a commission is also sometimes charged, varying from one-eighth to one per cent.

"The bills presented to a bank for discount may generally be divided into the following classes:

"1. Bills drawn by producers or manufacturers upon wholesale dealers.

"2. Bills drawn by wholesale dealers upon retail dealers.

"3. Bills drawn by retail dealers upon consumers.

"4. Bills not arising out of trade, but yet drawn against value, as rents, etc.

"Kites or accommodation bills.

"The first two classes of bills are the best, and are fair legitimate bills for bankers to discount. The third class does not generally meet with the same favor. They are for comparatively small amounts, and are drawn by shopkeepers and tradesmen upon their customers. To discount these bills freely would encourage extravagance in the acceptors; and ultimately prove injurious to the drawers. When a man gives notes or accepts bills to his butcher, baker, or tailor, he may fairly be suspected of living beyond his income. Solvent and regular people pay their tradesmen's accounts with ready money. The fourth class of bills, though sometimes proper, ought not to be too much encouraged. Persons out of trade have no business with bills. The last class of bills should almost always be rejected. To an experienced banker, who knows the parties, the discovery of accommodation bills is by no means difficult. They are usually drawn for even amounts, and for the longest term that the bank will discount, and are presented for discount soon after they are drawn. The parties are often relatives, friends, or parties who, from their avocations, can have no dealings with each other. The length of the period which bills have to run is also matter of consideration. The principal advantages to a bank of short dated bills compared with long dated bills are the following:—There is more safety in discounting short bills, because the parties may fail before the long ones fall

due; the commission (where this is charged) will be more in the course of a year upon any given amount of capital employed in discounting a succession of short bills than in discounting long bills; long dated bills lock up the funds of a bank, so that they cannot be discounted with safety but from the bank's own capital; for if a bank employs its deposits, or its circulation, in discounting long dated bills, and payment of the notes or deposits should be demanded, the long dated bills could not be rediscounted, and the bank must stop: long bills may encourage speculation; as persons may purchase large quantities of commodities in the expectation that the price will advance before the long bills which he accepts in payment shall fall due; while if the bills are of short date, this will be prevented." (GILBART'S *History and Principles of Banking.*)

Besides discounting bills, the banks render important services in attending to their due negotiation; it being customary for merchants and other people to send all the bills and drafts payable to them to their bankers, who become responsible for their regular presentation for payment, and for their noting if not paid.

2. A cash-credit is an undertaking on the part of a bank to advance to an individual such sums of money as he may from time to time require, not exceeding on the whole a certain definite amount, for repayment of which he enters into a bond with securities. Cash-credits are granted not only upon personal security, but also upon the security of stock in the public funds, or in railroad companies, also occasionally of lands or houses. To those requiring temporary advances of money, cash-credits possess the following advantages over discounts: the party can repay any part of the sum drawn at pleasure, and interest is charged only for the money actually employed: he has also the power of drawing, whenever he pleases, to the full amount of his credit; whereas, in the case of discounting bills, he must make a new application to the bank for each bill. To the bank the comparative advantage of a cash-credit in respect to bills, consists chiefly in its connecting the party more intimately with the bank; in the summary mode in which the bond may be recovered from the party or his securities; while to a bank issuing notes, the frequent operations under the credit give activity to its circulation. On the other hand, their comparative disadvantage to a bank is as follows: cash-credits, when once granted, cannot be called up, but bills of exchange soon fall due, and you can refuse to discount again. If you discount bills of exchange, they can be rediscounted to supply the bank with funds, if necessary, but advances on cash-credits cannot be replaced. In case of a panic or a run upon the bank, the persons having cash-credits might have occasion to draw upon the bank, and the notes would immediately be returned upon the bank, for payment in gold; but you could refuse to discount bills of exchange until the run was over.

3. Overdrafts on current or deposit accounts are similar in character to the drafts under a cash-credit, with this difference, that in a current account the party overdraws on his own individual security, and that on each occasion he has to obtain the permission of the bank.

In advancing money, whether by discounting bills of exchange or otherwise, a bank receives only the market rate of interest. But as this is a return which may be obtained for money without incurring the expense of an establishment for the purpose, it is obvious that no one would invest capital in the business of banking when it is to be confined to the loan department alone. The main object of the banker, however, is to procure, and employ on an advantageous footing, the money of other people, and his profits are nearly in proportion to the extent to which he can accomplish that object. The trading capital of a bank consists of —1st, the capital contributed by the partners; 2d, the money lodged in deposits; and, 3d, the money deposited for the purpose of remittance; to which has to be added, in the case of banks of issue, 4th, the amount of notes in circulation. These means are employed in—1st, discounting bills of exchange; 2d, advances on cash-credits, or overdrawn accounts; and, 3d, investments in the funds and other good securities. The surplus of the former upon the latter forms the *reserve* kept by the bank to meet current demands. The amount of reserve necessary in ordinary circumstances is to be estimated from experience, and the transactions and position of the bank; but as unforeseen events may occur which may render the bank liable to be called upon for the whole or a considerable portion of its liabilities, whether in the shape of deposits or notes in circulation, it is of consequence that the amount of trading capital arising from these sources should be invested in securities which shall rapidly revolve, and be at all times convertible. The securities which best fulfil these requisites are bills of exchange, and stock in the public funds, on which a bank can easily extend or diminish its advances in proportion to the capital which it may have to employ; increasing them when the deposits and circulation are increasing, and diminishing them when these are diminishing; while in anticipation of a run, the bills may be converted into money by being rediscounted, and the stock sold. Investments and securities not readily convertible cannot be made with safety except out of the capital belonging to the bank itself. See EXCHANGE, MONEY, NATIONAL BANKS, etc.

Bank-Note, or BANK-BILL, a promissory note for money to be paid on demand by a banking company. In the U. States, every National bank may issue circulating notes to the maximum value of 90 per cent. of their capital. These notes are printed and delivered by the public treasury on deposit of corresponding bonds. The notes issued by a National Bank are current in all parts of the country. There are still in circulation notes of $1 and $2, but the printing of these notes was discontinued on Nov. 1, 1878, in accordance with section 5,175 of the revised statutes, which provides "that after specie payments are resumed, no association shall be furnished with notes of a less denomination than five dollars." On Nov. 1, 1878, there were in the U. States 2,053 National Banks. Their aggregate capital was $473,530,426; outstanding circulation, $322,460,715; bonds on deposit, $349,408,900.

Bankrupt and **Bankruptcy**. A bankrupt, in English law, is a person who, either from the want of sufficient property, or from the difficulty of presently converting what he possesses into money, is unable to meet those demands of his creditors which the law gives them the power of instantly enforcing, and who has committed some act indicative of the situation in which he is placed. It is in the latter particular that a bankrupt differs from one who is insolvent. A man may, were his affairs examined, be found unable to pay his debts; but if his creditors are either ignorant of the circumstance, or, knowing it, trust to the return of prosperity, no one is injured, no

one's claim is resisted, and there is no necessity of applying the sweeping remedy of the bankrupt law. But when by resisting or evading the demands of creditors, a man has distinctly shown to the world that he has not wherewithal to meet the just demands on him, it has been deemed, in certain cases, necessary for a special law to step in and lay its hand upon the property of every description belonging to the debtor, in order that particular creditors may not, through an expeditious adoption of the ordinary remedies of the law, sweep away the whole in full payment of their debts, and thus acquire an advantage over less fortunate creditors beyond the just reward of their activity. To accomplish this end, a bankruptcy code appoints all the property of every description belonging to a debtor to be placed in the hands of trustees, to be by them converted into cash, and then to be distributed among the ordinary creditors in proportion to the amount of their respective debts. It is a principle of the commercial bankruptcy law of England, that after a certain time has been allowed for all the resources of the bankrupt to be investigated, and his property realized for behoof of his creditors, if he has conducted himself with candor and integrity, he is protected from their further prosecution, and left free to recommence the pursuit of wealth, untrammelled by any obligation to them previous to his bankruptcy.

In the American law the distinction between a bankrupt and an insolvent was never generally regarded, and was expressly abrogated by the act of Congress, Aug. 19, 1841. In 1867, however, Congress, acting under the authority of the Constitution, which authorizes it "to establish uniform laws on the subject of bankruptcies throughout the U. States," enacted a general bankrupt law; but that law was repealed in 1878, and every State is now again governed by its own laws on insolvency, assignments for the benefit of creditors, exemptions of property from liability for debts, and attachments of property upon mesne process. These different laws will be found briefly examined under the heading INSOLVENCY.

Bank-Stock, is the paid-up capital of any bank, usually divided into shares of a certain amount. These shares may generally be transferred by assignment.

Banqueroutier, the French term for a bankrupt.

Banquier, the French term for a banker.

Bantam-Work, gaudily varnished japanned work.

Banyan, a Hindoo merchant or trader; a confidential cashier and broker for a mercantile firm.

Bar, in navigation, an obstruction at the entrance of a harbor or river. Sometimes in bar-harbors vessels have to wait for the rise of tide before they can enter or quit the port. In commerce, the term is applied to any piece of metal having much greater length than diameter. *Bar-iron* is iron shaped into bars, and fitted for all sorts of iron work.

Barb, an Arab horse. — Part of a fish-hook.

Barbadoes. See WEST INDIES.

Barbadoes-Tar, a species of petroleum or bituminous oil, obtained in Barbadoes, which possesses some medical properties, as an external and internal application.

Barberry, a shrubby ornamental plant (*Berberis vulgaris*), a native of Europe and America. Its berries are of an oval shape, and, when ripe, generally of a bright red color. They are very acid, and not fit to be eaten raw; but when boiled with sugar, they form a most refreshing preserve. The bark and stem are very astringent, and yield a bright yellow dye.

Barbotine, an East Indian vegetable produce, the chief constituents of which are wax, gum, and bitter extract; also a name for worm-seed.

Barcelona. See SPAIN.

Barchet, a term used in Germany for a piece of stuff of 22 to 24 ells. The *B.* is the 45th part of the fardel.

Bare. When an article of merchandise is scarce, or is not in demand at a certain place, the market at that place is said to be *bare*.

Barège, a thin material used for ladies' dresses. It was originally a woollen fabric manufactured at Barèges, in France. It is now commonly made of cotton and wool, and the best is woven with a warp of silk.

Bare-Pump, a suction-pump for drawing liquors from a cask.

Bargain, an acknowledged agreement or verbal contract; a sale or purchase. By usage this word used alone has come to be taken for such transactions as are favorable to the buyer, as "I bought it at a *bargain*;" otherwise the term is qualified, as "*a bad bargain*."

Barge, a flat-bottomed boat, of which there are several kinds; they are mostly used on navigable rivers, for transferring heavy merchandise from ships to wharves, or from one quay to another.

Barile, the Italian cask as a liquid measure, varying in different localities. At Ancona the *B.* is 11·349; at Cerigo, for oil, 14·0298; at Florence, 9·6338, and for wine, 12·0442; at Genoa, 19·6086 for wine, and 17·083 for oil; at Leghorn, 12·041 for wine, and 11 gallons for spirits; at Naples the *B.* is 11·573; at Palermo, 9·436. In Trieste the Austrian *B.* is 144½ gallons.

Barilla, or SODA ASH, [Fr. *barille;* Ger. *barilla;* It. *barriglia;* Sp. *barrilla,*] an impure carbonate of soda, obtained by lixiviating the ashes of sea-weeds. It is brought to us from Sicily and Spain (the best from Alicante) in hard, porous masses. The best quality is of a bluish-gray color. The value of *B.* depends upon its purity. It usually contains from 16 to 24 per cent. of pure carbonate of soda, and occasionally 30 per cent. It is particularly used in the manufacture of soap and glass, and in bleaching; but it is much less used than formerly, on account of the cheapness with which soda is obtained from common salt. Average price in New York (in bbl.), 2 cts. per lb. *Imp.* free.

Bark, the outer covering of trees. Many barks enter largely into commerce for various economical and manuf. purposes. They are described in this work under their respective heads. In navigation, see SHIP.

Barkers, PETER FUNKS, TOUTERS, or CAPPERS, are fellows employed at mock-auctions to induce purchasers to enter the sale-room.

Barking, a technical name for coloring or tanning sails, nets, cordages, etc.

Barley, [Fr. *orge;* Ger. *gerste;* It. *orzo;* Sp. *cebada,*] a well-known species of grain (*Hordeum*), extensively raised in the Middle and Northern States and in Europe. Its varieties are distinguished either from the number of rows of grain

in the ears, or from the time of sowing them into winter *B.* and spring *B.* The principal consumption of *B.*, chiefly in America, is for malting. It is also valuable for culinary purposes, especially for thickening broths, soups, and puddings, after it has undergone the process of pearling. This is done by machinery, which removes the husk for *pot*, and a portion of the kernel for *pearl B.*, leaving the remainder smooth and round like shot. The average yield of *B.* in the U. States is about 30 bushels to the acre, and the weight 48 lbs. per bushel. The average crops of *B.* for the last seven years were as follows: acres, 1,477,809; bushels, 31,814,724; value, $25,082,158; value per acre, $16.97. In 1878 the exports (chiefly to England and Ireland) were 3,921,501 bushels; value, $2,565,736.

Barm. See Yeast.

Barn, a farm-building used for storehouse or granary.

Barnacles, a twitching instrument used by farriers, etc., to hold by the nose horses that are troublesome.

Barometer, a pneumatic instrument for measuring the weight of the atmosphere, or of its pressure on the surface of the globe, and thus indicates the state of the weather. The *dial B.*, whose only use is to indicate good and bad weather, is so called because it is provided with a dial on which moves a long needle (Fig. 26), which is put in motion by the mercury of the instrument itself. To the axis of the needle is fixed a pulley, O, on which is rolled a thread which bears at one of its ends a weight, P, and at the other a little heavier weight, floating on the mercury of the small branch of the *B.* If the atmospheric pressure increases, the level falls in the small branch, and the float follows it, drawing the pulley and needle from left to right. The contrary motion takes place when the pressure diminishes, because the mercury rises in the small branch, and with it the float. The result is that the needle stops on the words *variable, rain, fair weather*, etc., when the *B.* assumes corresponding heights, provided the instrument be well regulated, which is seldom the case.

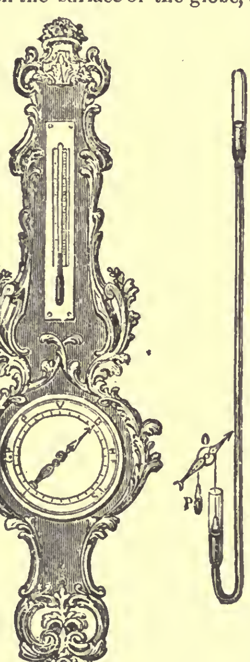


Fig. 26.—Barometer.

Barouche, a four-wheeled pleasure carriage, with falling top and seats.

Barque. See Ship.

Barracan, a thick, coarse camlet of wool or mixed material, used for cloaks or outer garments, and chiefly made in France.

Barral, the Spanish name for a large bottle, capable of holding an arroba or 4 gallons.

Barratry, is any fraudulent or other unlawful act committed by the master or mariners of a ship, without consent of the owner, and tending to his injury, as running away with the ship, wilfully carrying her out of the course of the voyage prescribed by the owners, sinking or deserting her, embezzling the cargo, smuggling, or any other offence, whereby the ship or cargo may be subjected to arrest, detention, loss, or forfeiture. By the laws of the U. States, acts of *B.* committed by "any captain or mariner, or any ship or vessel" are punishable by death. *B.* is one of the losses covered by insurance, and the owner may thus protect himself against the act of the master and sailors appointed by himself. It is the duty of the owner to prevent, as far as he may, the misconduct of the master; and if the former appear to have acted with gross negligence, the underwriter is not liable.

Barrel, a round wooden vessel or cask, made of staves and heading, having more length than breadth, bulging in the middle, and bound with hoops. It forms a variable measure of capacity for handling dry goods and liquids; a *B.* of wheat flour being 196 lbs.; of lime, 320 lbs.; of fish, 220 lbs.; of beef or pork, 200 lbs.; of wine and brandy (U. States and England), 31½ gallons; of oil (at Cincinnati), 43 gallons; of honey (at Havana), 6 gallons.—The *B. of a pump* is the hollow cylinder in which the piston moves.—The *B. of a wheel* is the cylindrical axle round which the piston moves.—*B. bulk*, in shipping phraseology, is a measure of capacity for freight, equal to 5 cubic feet; 8 *B.* bulk, or 40 cubic feet, making one ton of measurement.

Barrel, or Spring-Box, [Fr. *barillet;* Ger. *Das federhaus,*] the small cylinder of a watch, about which the spring is coiled (Fig. 27).

Barrique, [Fr.] a large cask or hogshead, of variable capacity, ranging, according to the commodity, from 40 to 83 gallons.

Barrow, a tray or light carriage of several kinds, there being hand-*B.* for two persons, wheel-*B.*, load-*B.*, *B.* for wheeling sacks, and porters' *B.* or trucks. See Wheel-Barrow.

Barsac Wine. See Sauterne.

Bar-Shoe, a particular kind of horse-shoe, made to protect the tender frog of a horse from injury.

Barter, an exchange of commodities; a rude mode of trade which, since the general diffusion of coined money and the precious metals, is almost obsolete, except in a few uncivilized countries.

B., in *Commercial Arithmetic*, is an application of the rule of proportion to the exchange of one commodity, of which both the rate and quantity are fixed, for another, of which either the rate or the quantity are alone fixed. As the value of the goods exchanged are equal, it is obvious that the product of the quantities multiplied into their respective rates will be also equal. Hence the following *Rule:* Multiply the given quantity and rate of the one commodity, and the product, divided by the rate of the other commodity, gives the quantity sought; or, divided by the quantity, gives the rate.

Bar-Wood, a red dye-wood, the produce of *Baphia nitida*, a small quantity of which is imported from Angola, in Western Africa.

Barytes, an earthy mineral, which is found both massive and crystallized in England, Bohemia, etc. Sp. gr. 4·5. The white *sulphate* of *B.*, or *heavy-spar*, being very heavy, and costing only

before grinding about $5 in England, is largely imported for adulterating white-lead. It is also employed in the manuf. of jasper-ware, in producing opaque white patterns as a colored ground, and in making a pigment called *permanent white*. The *nitrates of B.* are used in pyrotechny for producing a green flame; and the *carbonate of B.* in the manuf. of plate-glass, in color-making, etc. Nearly all these salts are virulent poisons. *Imp.* duty, ½ ct. per lb. for carbonate and sulphate; 20 per cent. for nitrate.

Fig. 27.—Barrel of a Watch-Spring.
A, barrel; *B*, chain; *C*, fusee.

Baryton, Barytone, a stringed instrument of music; a kind of bass-viol.

Bas, the French name for hose or stockings.

Basalt, a black and very hard stone of volcanic origin, used for the assaying of gold and silver.

Basane, the French name for tanned sheep-skin, used for bookbinding.

Basil Oil, an aromatic ethereal oil, obtained from the root of the pot-herb basil (*Ocymum basilicum*).

Basin, a bowl of various size and material for containing fluids; a wet dock, or harbor-inclosure for ships; the French name for dimity, a white cotton stuff mostly striped.

Basket [Fr. *panier* and *corbeille;* Ger. *körbe;* It. *paniere;* Por. and Sp. *canastas*], a well-known vessel of various form and size, made of flexible materials lapped or interwoven, and used for the stowage or conveyance of merchandise, fruit, vegetables, etc. Of late years much ingenuity has been exercised in this country in devising forms of *B.* for the carriage of fruit to market in packages of size proportioned to the character of the fruit. Osiers, splints, veneers, and paper have been employed. Some of these *B.* are made frustum-shaped, so as to pack in nests for return; others have been made folding or collapsible; others of so cheap material and workmanship as to be sold with the fruit. *Imp.* duty, 35 per cent. The finer kinds of *B.* are made by hand, but the commoner kinds are now generally made by machinery. A basket-making machine, for which there are many American patents, substantially consists (Fig. 28) of a circular wooden bottom-piece with radially projecting basket-strips, attached to the end of a rotating shaft; during the rotation of the bottom and radial strips, a filling-carrying device having a vibratory motion passes over and under the radial strips, and leaves the filling carried by it, and this filling is laid in compactly by reed-like pieces.

Bason, in hat-making, a triangular metallic plate upon which a covering of fur is laid and felted to make a conical napping or *pull-over* for a hat-body.

Bass Fibre. See Piassaba.

Bass or **Bast Mats**, a matting made in Russia from the thin layers of the inner bark of the lime-tree, used by gardeners for binding or covering plants, and also for baling and packing purposes. A full-sized Russian bast-mat weighs about 5 lbs. when new and quite dry; it is 7 feet long and 4 feet broad. They are largely imported in bales. *Imp.* duty, 20 per cent.

Basset-Horn, a musical wind instrument resembling the clarinet in tone and manipulation, but larger. It is seldom employed in the orchestra.

Bassette, a small bass-viol.

Bass-Horn, a musical wind instrument of deeper tone than the bassoon.

Bassoon, a musical wind instrument made of wood, and capable of being divided near the middle, so that the two parts may be of more convenient length for carriage. The *B.* has a reed and curved mouth-piece, and is played by means of keys and finger-holes like the clarinet, to which it forms the bass.

Basso-Relievo or **Low-Relief**, is the slight projection of a sculptured object from the plane surface, as in the case of the figures on medals, coins, friezes, etc.

Bass-Viol, or **Violoncello**, a stringed musical instrument resembling a violin, but larger, and having a graver tone. It is held in an upright position when played, the butt-end resting on the floor.

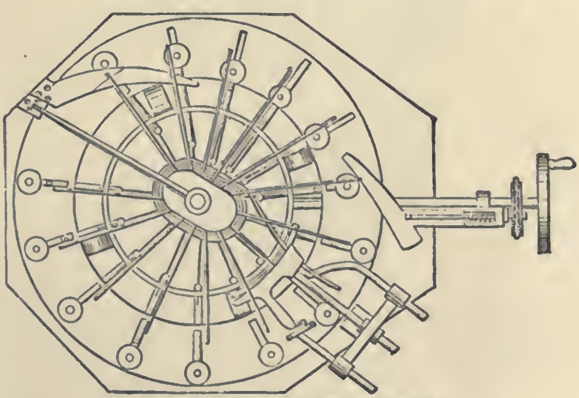


Fig. 28.—Basket-Making Machine.

Bass-Wood, a name given to the American linden-tree, *Filia Americana*. The wood is soft, easily worked, and is used for the panels of carriage-bodies, seats of chairs, the fans of fanning-mills, etc. It is also made into pulp, and then used as a material for paper-making. See Bast.

Bast, rope, cord, and matting made from the bass or linden tree; also a name for the bark or tough fibres of the flax and hemp plants. See Bass.

Bastimento, the Italian name for a ship.

Bat, a name for the tical of silver in the East, weighing 235 grains; also a club or striking instrument.

Batavia. See JAVA.

Batch, the quantity of bread baked at one time.

Bateau-a-Vapeur, the French name for a steamboat and steamship.

Bathing-Machine, a portable shed or room on wheels placed upon the sea-beach for the convenience of bathers.

Batiste, the French name for cambric or lawn, the finest kind of linen, named after Batiste, who first made it at Cambray.

Batman. See MAUND.

Batta, a term used in India to denote a percentage, or allowance. Thus, the Sicca rupee is said to bear a *batta* of 16 per cent. against the current rupee, as 100 Sicca rupees = 116 current rupees.

Batten, in weaving, an instrument for striking the weft home. — Also a piece of fir or pine timber used for floors, and as a ground for laths, not exceeding 7 in. in breadth, about 2½ in. thick, and 6 or more feet in length. *B.-ends* are pieces under 6 feet in length.

Fig. 29. — BAY-TREE, OR LAUREL.

Battery. See GALVANIC BATTERY.

Batting, cotton in sheets prepared for interlinings, bed-covers, etc.

Battledore, a rack; a child's plaything for keeping up a shuttlecock; an instrument for striking a tennis-ball.

Batts, carded cotton prepared in sheets and sold as batting.

Baudruche, the French name for gold-beaters' skin.

Bauge, a drugget made in France with thread upon thick and coarse wool.

Bausch, BUSCHT, a German term in the paper trade for 181 sheets of paper.

Bavaria, [Ger. *Bayern*,] a kingdom in the S. W. of Germany, and, next to Prussia, the most important member of the German Empire. *Area*, 29,292 sq. m. *Pop.* 5,022,390. It is subdivided into 8 provinces. Capital, Munich [Ger. *München*]; *pop.* 193,024. The government is a limited monarchy, with chambers of councillors and deputies, regulated by a deed of constitution of May 26, 1818.

B. consists of two parts, separated by Hesse-Darmstadt, Baden, and Wurtemberg. The larger or eastern portion, lying bet. lat. 47° 20′ and 50° 41′ N., and lon. 9° and 13° 48′ E., comprehends 7 of the 8 provinces. This country is mountainous and woody towards the south, and contains a number of lakes and marshes. To the northward are rich and extensive plains until we reach the Danube, beyond which it is again mountainous and woody. The division called Rhenish *B.* is a small but densely inhabited country, extending from lat. 48° 57′ to 49° 50′ N., and from lon. 7° 6′ to 8° 31′ E. *B.* is essentially an agricultural country, and its soil is in general fertile. Wheat, rye, barley, and oats are the chief objects of culture; next to which are vine and hop plant; considerable attention is likewise given to flax, hemp, fruit, liquorice, and madder. The chief mineral products are iron, coal, and salt; but quicksilver, gold, silver, cobalt, and some other metals are likewise found. Manufacturing industry is mostly diffused over a number of small dealers. The principal article is linen; the others are woollens, worsted hose, cottons, hardware, arms, beer, toys, leather, paper, glass, porcelain, and straw-platting.

The internal commerce of *B.* is chiefly conducted by the Danube in one direction, and the Rhine in the other. Exports:—Grain, salt, timber, potash, fruit, liquorice-root, seed, hops, cattle, sheep, swine, flax, yarn, coarse linens, glass, leather, Nuremberg wares, beer, etc. *B.*, for an inland country, is favorably situated for commerce; it has good lines of railroads, and is the channel of a considerable transit trade between the other German States and Switzerland, Austria, and Italy.

The chief commercial and manufacturing cities besides Munich, are *Augsburg*, *pop.* 57,210; *Nuremberg* [Ger. Nürnberg], *pop.* 91,017; and *Ratisbon*, *pop.* 35,000. Augsburg formerly occupied the place now held by Frankfort as the chief money-market of Central Germany; and banking and exchange operations are still one of its principal sources of wealth; it also carries on an extensive transit trade, is noted as a wine depôt, and has extensive printing, engraving, and bookbinding establishments.

Measures, Weights, Money are those of the German Empire.

Banking.—The usance for bills on Augsburg is 15 days' sight; half usance, 8 days. Bill transactions are settled weekly on Wednesday, and those which fall due on that day are not payable till the Wednesday following. Bills have thus from 1 to 8 days' grace; but those drawn *à vista* (at sight), must be paid within 24 hours after being presented. There is at Munich a banking Co. which issues notes, discounts bills, and lends money on mortgage; it is sanctioned by government, but the latter is not responsible for its engagements.

Finances.—The public revenue is about $53,000,000, and the expenditures nearly the same. The debt of the kingdom in 1878 was $272,147,305. This considerable debt was created in part by the deficits of former years, and in part by the construction of public works, especially railroads. The greater number of the railroads in *B.*, constructed at a cost of $62,500,000, are the property of the State.

Bawla, matting for thatch made of the leaves of the cocoa-nut in the Pacific Islands.

Bawsin, leather made from sheep's skin.

Bay, a horse of a bright-red brown, inclining to a chestnut color. — The laurel-tree (*Laurus nobilis*), a native of the south of Europe and of Asia. It attains a height of 20 to 30 feet. The leaves are smooth, evergreen, lanceolate, and wavy at the margin; and afford, when bruised or burnt, a grateful aroma, which occasions their employment for culinary purposes. But the part chiefly valued is the fruit or berry, which is small, ovate, dark, purple-colored, aromatic, and bitter. It has long been used in medicine as a stimulant and carminative. The husks of the berries contain a great quantity of volatile oil; and the kernels furnish by expression a flat greenish oil, which is much employed in embrocation. *Bay-berries* and *oil* are imported from Trieste, Italy, and Spain. *Imp.* duty: on bay-berries, free; on fined or ex-

pressed oil, 20 cents per lb.; on essential oil, $17.50 per lb.

Bayberry Tallow, a fragrant green wax, from which candles have been made. It is found attached to the berries of the Candleberry, Bayberry, or Wax Myrtle (*Myrica cerifera*), a small shrub of North America.

Bayonet, a pointed spear, an offensive weapon made to fix on the barrel of a musket.

Bay Rum, BAY WATER, a spirituous perfume like Eau de Cologne, made in the West Indies from the leaves of a species of bayberry (*Myrica acris*) distilled in Jamaica or Santa Croix rum. The Bay rum extensively used by barbers as a wash for the head is generally a fictitious article, consisting of some drops of the essential oil extracted from the leaf with distilled spirits. *Imp.* duty, as alcohol; when under 54° strength, $1 per gallon, 1st proof, and in proportion for any greater strength; on essence or oil, 50 cents per oz.

Bay Rush, a plant common in the Bahama Islands, which furnishes much farina, that can be made into bread.

Bay-Salt, salt made in the salinas, or natural ponds, by evaporation from sea-water exposed to the sun.

Bay-Wood, a name for the inferior variety of mahogany growing along the Bay of Honduras.

Bazaar [Per. *a market*]. In Oriental countries this term is used to distinguish those parts of towns which are exclusively appropriated to trade. The principle of the *B.* is association for facility of reference; all the shops of a city are placed together; and the different trades and occupations are severally collected in different parts of the *B.*, instead of being indiscriminately mingled as in our streets. Thus the saddlers are found to occupy one passage, the pipe-makers another, and so on. The great bazaars consist of a connected series of these passages, or lanes, vaulted with high brick roofs, surmounted by domes which admit a subdued daylight; and those of superior description are sometimes decorated with paintings. The passages are composed of a series of recesses or stalls, the floor of which is raised from 4 to 3 feet above the ground. These recesses, which are entirely open in front, are scarcely more than closets; but in the most respectable parts there is generally a door in the back-wall which leads to another apartment that answers the purpose of a store-room. The front part is the shop, on the floor of which the merchant sits with his goods so placed that he has seldom to rise, which, if he is a Turk, he rarely does without manifest reluctance. Long bargaining is common, and an apparent indifference is exhibited both by buyer and seller; the latter, as he sits smoking his pipe, being indeed the personification of luxurious repose. Not only trades, but handicraft employments are carried on in the *B.* The stocks of the individual dealers are seldom of much value, but an improving effect is produced by the exhibition of the whole in a connected form, whence arises the splendid appearance of the oriental *B.* Business commences and terminates with daylight, and none of the shopkeepers or artisans reside in them. Wholesale dealers have no open shops in the *B.*, but they have warehouses in them, or in their vicinity. In America and Europe the name *B.* is chiefly applied to a fancy repository.

Bazaar-Maund, Bazaar-Weight. See MAUND.

Bdellium, a gum-resin of a brownish-red color. It burns with a balsamic odor, and resembles myrrh in taste, smell, and medical properties. The Indian *B.*, which is the best, is obtained from the *Balsamodendron Mukul;* the African *B.*, which has a feeble odor and bitter taste, is obtained from *Hendelotia Africana*. *Imp.* free.

Beacon, a signal, a buoy, or light for the guidance of mariners.

Beading, is an artificial property given to spirits, of beading on the surface, or hanging in pearly drops on the sides of the glass containing it.

Bead-Plane, a moulding plane of semi-cylindrical contour.

Bead-Proof, the standard strength among distillers for alcoholic liquors, when tested by the glass bubbles or hollow beads used as floats, but which are now superseded by more accurate meters.

Beads, are small perforated globes or balls of glass, ebony, coral, amber, etc., which range from seed beads to a very large size. They are used as ornaments for the person, and form a large article of commerce with Eastern countries, Africa, and North American Indians. They are also employed by Roman Catholics for the purpose of counting a series of prayers called the *Rosary*. Glass *B.* are made in large quantities at Murano, near Venice. *Imp.* duty on *B.* and *B.* ornaments (except amber, which is free), 50 per cent.

Beaker, a jug with a spout. — A glass vessel in the shape of a goblet used in chemistry.

Beak-Irons, instruments for working sheet-metal.

Beam, a large piece of timber used as a support for flooring in a house, or for the decks of a ship. — The horizontal bar or support of iron or other metal, from the ends of which the scales of a balance are suspended. — That part of a steam-engine to which the piston is attached — In weaving, a wooden cylinder on which the web is wound. — The width of a ship from side to side.

Beam and Scales. See BALANCE.

Beam-Compass, an extending instrument for drawing circles or axes of very large radius.

Beam-Filling, that portion of a vessel's cargo which is stowed between the beams.

Beam-Timber, the hard, fine-grained wood of the beam-tree (*Pyrus aria*), used in Europe for cog-wheels, etc.

Beans, [Fr. *fèves;* Ger. *bohnen;* It. *fave;* Port. *favas;* Sp. *habas*,] a well-known pulse (*Vicia faba*), of which there are one or two varieties cultivated for culinary purposes in gardens, and in a more extensive scale in fields, for horse provender and cattle feeding. A bushel of *B.* must weigh 62 lbs. *B.* are largely exported from the U. States. *Imp.* duty, 10 per cent; as seed, 20 per cent.

Beans and Nuts, a trade term for a kind of small coal.

Bean-Sowing Machine, a drill for planting beans in rows.

Bear. There are several species of this well-known quadruped; the most important, however, are the brown and black *B.*, *Ursus antos* and *Americanus*, and the polar or white *B.*, *Ursus maritimus*. The *B.* is an object of commercial utility for menageries and zoological collections, and also for its skin and grease. The flesh of the black *B.* is extremely delicate, the hams in particular being

much esteemed. — A stock-exchange term for a jobber or dealer who, having sold stock or shares which he does not possess, is anxious that such securities should decline in value, so that he may be enabled to buy at a profit. The term is said to derive its origin from the story of the man who sold the bear-skin before he had killed the bear.

Bearberry, a dwarf branching shrub, *Arctostaphylos alpina*. The leaves, imported from England, are used in medicine.

Bearer, one who presents a check, draft, or other order for the payment of money. If a check, bill, or note be made payable to bearer, it will pass by delivery only, without indorsement; and whoever fairly acquires a right to it, may maintain an action against the drawer or acceptor.

Bear's Grease, the grease or oil obtained from the fatty parts of the black or white bear, and made into a pomatum, used for promoting the growth of the hair.

Bear-Skins, the skins of the various species of bear, which are much prized for robes, hearth-rugs, and sleigh coverings. Bear-skin is also the trade name of a kind of heavy cloth with a long nap.

Beaters, the striking parts of thrashing or other machines or mills.

Beaujolais Wine. See BURGUNDY WINES.

Beaver, a small rodent animal (*Castor fiber*, Fig. 30), once abundant in all the northern parts of America, but now found only on the Upper Missouri and the unsettled parts of the Canadas. The *B.* is characterized by industry, ingenuity, and instinctive skill in building dams and bridges. Its body, about 2 feet long, is covered with a thick, glossy fur, of a most commonly chestnut-brown color, which is used for making hats and caps. The *B.* furnishes also a peculiar odoriferous secretion termed *Castoreum*.

Fig. 30. — BEAVER.

Beaver-Cloth, a species of heavy felted woollens, chiefly used for overcoats, made in England, Germany, France, and the U. States.

Beaverteen, a kind of fustian, made of coarse twilled cotton, which is shorn after dyeing.

Becket, a sea term for a piece of rope.

Beck-Iron, a piece of metal bent at right angles for the purpose of securing wood firmly on the bench while planing.

Bed-Clothes, the blankets, sheets, and quilts spread upon a bed.

Bedding, the furniture and appurtenances for a sleeping-couch.

Bedding Plants, young plants from a nursery, fit to be transplanted into beds.

Bed-Spread, a coverlet or counterpane.

Bedstead, a framework of wood or metal, to support a bed. *B.* bear various names, according to shape and size, and are largely manuf. for home use.

Bed-Ticking, a stout material of cotton or linen, for making bed-cases to hold feathers, flocks, etc.

Beech [Fr. *hêtre*]. The common *B.* of Europe (*Fagus sylvatica*) and the red *B.* of North America (*F. ferruginea*) are very beautiful forest trees, growing to the height of about 100 feet (Fig. 31). The fruit is a triangular nut, called *beech-mast*, which is edible, valuable as food for swine, and yields a large proportion of a bland fixed oil which is used as food and burned in lamps. The wood is of close texture, though not so strong as the grained timbers against a cross strain. When exposed to alternate drought and moisture it soon decays, but lasts long when kept constantly wet. It is used for machinery, furniture-work, presses, stocks and handles of tools; also for keels of ships, and for planking in parts kept constantly under water. It is, however, little used in building, and though easily turned, it is not adapted for hollow vessels, as it is apt to split when quickly dried after being wet.

Beef, the flesh of oxen and cows, fit for food, which is either used fresh or cured. Salted *B.* of commerce is classed into mess, prime, mess extra, India, India mess. It is usually quoted in the U. States under the general head of "Provisions," and is packed in barrels containing 200 lbs.—For many years there has been a search for new outlets to American meat-products. Shipments of cured and pickled *B.* have largely augmented in bulk and value; but growers and shippers have not been satisfied, craving the higher prices of prime fresh *B.*, or the saving of heavy transportation bills by the processes of concentration. Numerous patents have been granted for extract of *B.*, or other cooked and canned products convenient for safe and cheap shipment. The results have not been altogether satisfactory, as the profits only warranted the use of cheap beeves of Texas. Enterprising shippers believed it possible to send abroad the best American corn-fed *B.*, by the use of refrigerating processes, in the fastest steam-ships, and present it in the principal markets of Great Britain in perfect soundness of condition, in competition on its own merits with English *B.* of famous repute. The first shipment of fresh *B.* was made to England by Mr. Timothy C. Eastman, of New York, in Oct., 1875, and with such success as to command a constant extension of this newly-developed business, in which New York, Philadelphia, and other cities, are now engaged. English authority makes the statement that most of the live-stock from the U. States is superior in quality and condition to that imported from Holland and other parts of the Continent, and that there is a juiciness and flavor about the *B.*, and an equal distribution of fat and lean, that are not wholly attainable except through the American system of full grazing. It hardly seems probable that any other country can successfully compete with the cheap and luxurious pasturage of the U. States in a degree sufficient to interfere with

the new-established meat-trade, which is a very prominent feature in the meat-distribution of this country. Its extension must depend upon the continuance of a difference between American and English prices sufficient to constitute a satisfactory margin for expenses and profits. One condition needing amendment is evidently the weight of our beeves. Were there a larger proportion of heavy, fully-fattened animals, the price realized would be increased above the advance of cost. Feeders have their share in this work, and must coöperate with shippers if they would develop a permanent and profitable industry. The competition will tend to advance home-prices in proportion to the comparative magnitude of the shipments. Such advance would tend to limit the growth of the trade, even to the destruction of the business, if the margin should be reduced below expense of shipment. A more scientific course of feeding, the exercise of skill and the practice of economy in all the methods of management and feeding, become, therefore, essential elements of growth and success in transatlantic shipments of American *B.* In 1878 the exports of fresh *B.* (all to Great Britain — less 487,690 lbs. first shipment to France) amounted to 54,046,771 lbs., value $5,009,856. The exports of salted or cured *B.* for the same year, to almost every country in the world, amounted to 38,831,379 lbs.; value, $2,973,234.

Beef-Wood, SWAMP OAK, or BOTANY BAY OAK, the produce of a species of *Casuarina*, which grows in Australia, is a hard, close-grained, reddish wood, variegated with dark and white streaks. It is exported to England, where it is used for ornamental work.

Bee-Hive, a straw basket, glass case, or other enclosure set apart for bees to carry on their industrial operations in.

Beer. [Ger. *bier;* Fr. *bière.*] (*Drinks.*) A fermented liquor made from malted grain. In Europe, most commonly of barley; in America, from wheat; and in India from rice. Hops and other bitter substances are added to improve the flavor and to impart their peculiar properties to the liquor. The drink in some of its varieties appears to be of great antiquity, and was probably discovered by the Egyptians. In 1878 the exports of *B.* from the U. States (mostly to Canada, Mexico, Brazil, U. S. of Colombia, etc.) amounted to $147,197, while the imports (mostly from Great Britain and Germany) amounted to $592,707. *Imp.* duty: in bottles (duty on bottles included), 35 cts. per gal.; otherwise than in bottles, 20 cts. per gal.

The manuf. of *B.* from barley is divided into two distinct processes — *malting* and *brewing.* Malting consists of four successive operations: steeping, couching, and flooring, which have for object the germination of barley; and kiln-drying, which consists in drying the germinated barley in a large and heated room called *kiln.* Barley is then *malt.* The appearance of the malt, and the color of the *B.* made from it, depend upon the temperature of the kiln. At between 90° and 100° F. pale malt results; at 120°–125°, amber malt; 150°–170°, brown malt for porter and stout; 360°–400°, black malt used for coloring porter. The object of changing the barley to malt is to render its constituents soluble, and bring them into a condition suitable for fermentation. Brewing consists in crushing the malt, and placing it in a mash-tub with warm water. Here the starch of the malt is transformed into dextrine and glucose, which, with the soluble albuminous and saline constituents, are taken into solution by the water. The infusion obtained is called *wort.* The wort is then boiled with hops, cooled, fermented, cleansed, and then transferred to store-casks, where a slow fermentation occurs, the *B.* develops its fined qualities, and is finished for use. The composition of the water used in brewing is supposed to exert an important influence on the success of the process. *Ale* is prepared from pale malt, and the active fermentation is checked while there still remains a considerable quantity of sugar unchanged. *Pale ale* is made from malt dried in the sun or by steam. It is not allowed to rise above 72° during the fermentation. The formation of acetic acid is thus prevented, and the unpleasant flavor due to the solution of the yeast by the alcohol is avoided. *Scotch ale* is a sweet strong ale. *Small beer* is a weak liquor made by using little malt, or by mashing with fresh water the malt residuum left after the wort for ale or porter has been drawn off. *Porter* is a dark-colored *B.* made from a mixture of pale, amber, brown, and black malt. *Stout* is strong porter. *Berlin white beer* (*weiss beer*) is prepared by quick fermentation from a mixture of 1 part of barley malt and 5 parts of wheat malt, with half a pound of hops per bushel. The *Lager B.* of the U. States is the *B.* of Bavaria; it owes its name (from *lager*, a "storehouse") to the fact that it is stored in cool cellars or vaults for several months before it is used, and its remarkable keeping qualities and highly-prized properties to the peculiar kind of fermentation by which it is produced. There are three varieties of this *B.: Lager*, or summer *B.*, which is not ready for use in less than from 4 to 6 months; *Schenk*, winter or present-use *B.*, ready in 4 to 6 weeks; *Bock B.*, which is an extra

Fig. 31.—BEECH-TREE.

strong *B.*, made in small quantity and served to customers in the spring, during the interval between the giving out of the schenk *B.* and the tapping of the lager. It requires 2 months for its preparation.

Chica, or maize *B.*, was used by the S. American Indians before the Spanish conquest. *Bourza*, or millet *B.*, is made by the Crim Tartars. *Quass*, or rye *B.*, is a sharp, acid beverage prized by the Russians. *Koumiss*, or milk *B.*, is prepared by the Tartars from mare's milk, which they dilute and ferment. *B.* is a nourishing drink from the gum, sugar, and starch it holds in solution: its stimulant and tonic properties are due to the alcohol and the bitter principle of the hops. The proportion of alcohol per cent. varies from 8·88 to 4·20.

Within the last twenty years, the brewing of lager *B.* has become one of the most important industries of the U. States, and is only prevented from becoming a very large article of export to S. America by the high duties imposed there on U. States products, in retaliation for the prohibitive duties of the latter country on imports. In

the city of N. York alone, the official returns of *B.* sold by N. York brewers, in the year ending May, 1878, amounted to 1,184,557 bbls. There are, according to the latest returns, in the U. States at present in active operation 2,600 breweries, producing annually for sale and consumption, in round figures, 285,000,000 bbls. of *B.*, and the capital invested in breweries and malt-houses is estimated at $102,900,790.— See BREWER.

Beeswax, a substance obtained from the honey-comb after the expression of the honey, used for making candles, sealing-wax, polishing furniture, etc. Two kinds occur in commerce, the yellow and the white or bleached — the last one generally adulterated with spermaceti. *B.* is largely produced in N. Carolina and some of the Western States; it is also extensively imported from British Gambia (Africa), Cuba, and the East Indies. *Imp.* duty, 20 per cent.

Beetle, a heavy wooden hammer or mallet for driving piles, palisades, etc.: when used by paviors it is called a *rammer.*

Beetle Shirtings, are cotton goods finished to imitate linen shirtings.

Beet-Root Sugar. The beet is a biennial plant, *Beta vulgaris*, distinguished by its large succulent root (Fig. 32). Of this species the two principal varieties are, — the red *B.*, which is cultivated in our gardens for the table; and the white *B.*, extensively used in France and other parts of Europe for the manuf. of sugar.

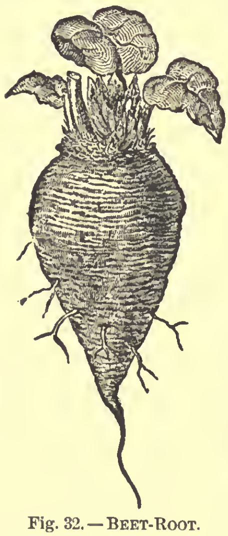


Fig. 32. — BEET-ROOT.

Sugar is derived from the juice of the beet-root by operations nearly the same as those by which cane-sugar is made; when refined, it is undistinguishable from the cane-sugar. Five tons of clean roots yield about 4½ cwts. of coarse sugar, which give about 160 lbs. of double-refined, and 60 lbs. of inferior lump-sugar; the remainder is molasses. In 1873, the production of *B.* sugar in Europe was as follows: France, 400,000 tons; Germany, 260,000; Austria, 205,000; Russia, 150,000; Belgium, 80,000; Holland, etc., 35,000: — total, 1,130,000 tons.

The belief that the *B.* would be made to yield in the U.States, as in France and Germany, sugar of good quality, in sufficient abundance, and at a sufficiently low cost to take the place eventually of the imported sugars produced from the tropical cane, has not been yet realized; although no pains have been spared to insure success, and large sums have been expended by capitalists in the equipment of factories, etc., at different points in the country, notably at Chatsworth, Ill., in Sauk County, Wisconsin, and in California.

Beeves, a common name for oxen or slaughtered cattle.

Begass, the stalk of the sugar-cane after the juice has been expressed, which is used for fuel and manure.

Beggud, the East Indian name for tin-foil, usually shipped in packages of 200 leaves (100 corges).

Belgium, a western kingdom of Europe, between lat. 49° 27′ and 51° 31′ N., and lon. 2° 27′ and 6° E., bounded N. by Holland, E. by Germany, S. by France, and W. by the German Ocean. Government is a constitutional monarchy, with a senate and house of representatives; the members of both chambers being elected by those citizens who pay not less than $8.60 annually of direct taxes. About 58 per cent. of the inhabitants are Flemish, the rest Walloon and French, with 39,000 Germans in Luxemburg. The capital, Brussels, one of the most splendid cities in Europe, has 376,965 inhabitants. There are, besides, 3 cities with a pop. of above 100,000 inhabitants, namely, Antwerp, 145,101; Ghent, 130,092; and Liege, 115,956. *B.* is divided into 9 prov., the area and pop. of which were as follows on Jan. 1, 1879:

Provinces.	Area in Sq. Miles.	Population.
Antwerp (Anvers)	1,093	522,735
Brabant	1,268	942,247
Flanders { West	1,249	691,190
Flanders { East	1,158	863,696
Hainault	1,437	949,346
Liege	1,117	635,076
Limbourg	931	204,619
Luxemburg	1,706	208,339
Namur	1,414	319,386
Total	11,373	5,336,634

The coast-line of *B.* is about 46 m. in length, and presents a uniform succession of low dunes or sandhills. The country is in general level, except in the prov. of Liege and Namur, where the surface becomes irregular, and in some parts hilly. The soil of the flat country is in most parts light and sandy; but is rendered exceedingly fertile by the constant application of manure, to obtain which the attention of the cultivator is especially directed to the rearing of cattle. The climate is temperate and healthful; and the common objects of culture are wheat, rye, barley, oats, buckwheat, potatoes, turnips, hemp, flax, beet, hops, and chicory, with artificial grasses. A variety of fruits are also grown, and some tobacco. About nine-elevenths of the country are under cultivation, and of the remainder, the greater part is occupied by forests, towns, roads, canals, and railroads, which cannot be deemed unproductive. *B.* is the most densely populated country in Europe.

The mineral productions are numerous and abundant, particularly in the S. and E. portions of the kingdom, comprehending Hainault, Namur, Luxemburg, and Liege; and the working of mines constitutes a valuable branch of the national industry. Of the mineral products, the first in point of importance is coal, of which, in 1878, there were produced 15,162,715 tons. The three great centres of the coal-mines are Mons, Charleroy, and Liege. Iron mines are numerous, especially in the district between the Sambre and the Meuse; and in 1878, the quantity of prepared ore worked up was 3,612,000 tons. Lead is found in Liege, Namur, etc.; copper in Hainault and Liege; zinc in Namur and Hainault; besides which the mineral products of the S. and E. prov. embrace manganese, calamite, sulphur, and alum, also various kinds of stone, slate, marble, and clay fitted for the manuf. of porcelain.

B. excels in almost all branches of industry. One of the most important of its manufs. is that of woollen cloths (particularly black cloth), the chief seats of which are at Verviers, Liege, and Dalhem; carpets are made at Tournay; linens at Ghent, St. Nicolas, Termonde, Courtray, etc. The cotton manuf. employs about 150,000 hands; Ghent, St. Nicolas, Antwerp, and Mechlin contain the principal factories. There are important manuf. of silk in Antwerp, Siene, Uccle near Brussels, etc. The lace of Brussels and Mechlin has long been celebrated; the ribbons of every kind are made in large quantities at Antwerp, Tournay, and Ypres. The melting and manuf. of iron, copper, and tin is carried on extensively from the abundance of these metals and of coal, and charcoal from the forests. The principal groups of forges are between the Meuse and the Sambre, at Charleroy, and on the banks of the Meuse, extending from its entrance into Belgium to the limits of Namur and Liege. The iron manuf. comprehend steam-engines, cannon, and firearms, all made on a great scale in Liege; and cutlery and iron utensils in various localities. The chief other manuf. are those of hosiery, employing about 75,000 persons, mostly in the arrondissement of Tournay: porcelain at Sept-Fontaines, Brussels, Ardennes, and Tournay; glass at Namur, Liege, Val-St.-Lambert, and Charleroy; beet-root sugar and refining at Ghent; besides beer, leather, salt, paper, hats, and a great variety of other articles.

The internal commerce of *B.* is facilitated by magnificent rivers, particularly the Meuse and the Scheldt. There are also numerous canals; among them, the Great Northern Canal, from Neuss on the Rhine (in Prussia) by Venloo on the

Meuse to Antwerp, and with which communicate, by means of the Scheldt, the Lievre and Bruges canals; the Ostend and Dunkirk canals, reaching the sea at different points; the Brussels canal, and the Louvain canal. There is besides a dense network of railroads, the length of lines open to traffic in 1878 being 2,264 miles. The total length of telegraph lines in 1877 was 3,098 miles, and the length of wires, 13,189 miles.

The foreign trade of *B.* is officially divided into "general commerce," including the sum total of all international mercantile intercourse, direct as well as transit, and "special commerce," comprising such imports as are consumed within and such exports as have been produced in the country. The value of the general commerce in 1876 was represented by $491,336,600 of imports, and by $433,568,600 of exports. The special commerce was as follows:—Imports for home consumption, $291,675,000; exports of home produce, $224,736,400. France heads the list of importing countries in the special commerce of *B.*, followed, in order of importance, by Great Britain, Holland, Germany, Russia, and the U. States. In the export market of Belgian produce France likewise takes the first place, followed by Great Britain, Holland, Germany, and the U. States. The international commerce of the kingdom is almost entirely carried on by foreigners, chiefly under the British flag. The commercial marine, on the decline for a number of years, consisted in 1878 of 57 vessels, of an aggregate burthen of 45,322 tons, inclusive of 24 steamers of a total burthen of 30,397 tons.

The commercial intercourse of *B.* with the U. States in 1878 was as follows:—Exports, $3,982,842, principally consisting of chemicals, $112,356; paper materials, $264,289; furs, $135,674; glass, $1,460,220; pig-iron, $243,619; brown sugar, $129,117; wines, $160,591; cloths and cassimeres, $201,406. Imports, $22,388,075, principally consisting of cattle, $67,850; wheat, Indian corn, rye, etc., $6,205,259; cotton, $1,557,189; leather, $291,111; mineral oils, $5,265,589; bacon and hams, $1,013,423; lard, $2,463,499; turpentine, $196,800; tallow, $114,304; tobacco (leaf), $1,061,355; wood (boards, deals, etc.), $108,321.—32 American vessels (tonnage 29,506) entered Antwerp; and 25 American vessels (tonnage 25,893), of which 13 were in ballast, cleared that port.

B. communicates with the sea at Antwerp, Ostend, and Nieuport, by the canal of Bruges to Oostburg, by the canal of Dunkirk to Furnes, by the canal of Ghent to Terneusen, by the canal of Termonde to Hulst, by the Scheldt from Flushing to Antwerp, by the same river and the canal of Willebrock from Brussels to Antwerp, and by the canal of Louvain and the Scheldt from Louvain to Antwerp. But the only seaports of any consideration are Antwerp and Ostend.

Antwerp, a strongly fortified and magnificent town, is situated in 51° 14′ N. and 4° 22′ E., on low ground, on the right bank of the Scheldt, where the river makes a considerable bend. It is about 45 m. from the mouth of the Scheldt, reckoning from Flushing, where vessels bound for Antwerp must take a Dutch pilot as far as Lillo. The river at Antwerp is about 400 yards broad, and large vessels may sail up to the quay, and into a large basin; the depth of low water in front of the city being from 32 to 42 feet. Its commerce is considerable, and about 2,000 vessels annually enter its port. It connects directly with New York by the Red Star and White Cross lines of steamers. *Pop.* 145,101.

Ostende, a fortified seaport of West Flanders, is situated in 51° 10′ N. and 2° 54′ E. It possesses great facilities for carrying on trade with the interior by means of railroads and canals. The town is almost surrounded by two of the largest of these, particularly that leading to Bruges, into which ships of great tonnage may enter with the tide. *Pop.* 16,735.

Money, Weights, and Measures, are those of France.

The usance of bills from London or Paris is 1 month's date. No days of grace are allowed.

Finances. The public income and expenditures of *B.* in recent years have mostly been balanced, with an occasional surplus. For the year 1877, the revenue amounted to $50,809,150 and expenditures to $49,288,500. On Jan. 1st, 1878, the total amount of the national debt was $184,909,800, on which $57,000,000 represent the share which *B.* had to take in the national liabilities of Holland, after separating from that kingdom. Almost the entire remainder of the debt of *B.* was raised for or devoted to works of public utility, particularly the construcling of State railroads.

Bank of Belgium. The National Bank of Belgium is modelled on that of the Bank of France. Its capital consists of 25,000 shares each of 1,000 francs: it issues paper payable on sight and to bearer to the amount of 20, 50, 100, 500, and 1,000 francs; but without permission from government cannot increase its issues beyond three times its metallic reserve. This bank pays large dividends to holders of its stock.

Bell, a sonorous instrument, constructed of hollow metal, for calling attention in a house, or for ringing chimes and striking the hours and quarters, etc., or in churches and public buildings. Small *B.* are cast in sand, large *B.* in loam. *Imp.* duty: (church *B.*) 35 per cent.; (silver, German silver, or gold *B.*) 40 per cent.; (copper *B.*) 45 per cent.

Belladonna, the deadly nightshade (*Atropa belladonna*), an herbaceous plant of Europe, all the parts of which are narcotic and poisonous. The extract of *B.* is used in medicine. The root and leaves are imported, free of duty.

Belleville and Southern Illinois R.R., runs from Belleville (12 m. S. E. of St. Louis) to Duquoin, Ill., 56·4 m. Offices, Belleville, Ill. This line was opened in 1861, and is leased and operated by the S. L., A. and T. H. R.R. Co., who furnish the rolling-stock for a rental of 40% of gross earnings up to $7,000 per m.; 30% on all exceeding and up to $14,000 per m. Cap. stock, $1,680,000. Bonded debt (secured by 1st mortgage and guaranteed by lessees), dated 1 Oct., 1866, payable in 30 years, $1,100,000, interest 8% (April and Oct.). Rental recd. for 1878, $98,351.99.

Bell Metal, an alloyed metal usually in the proportion of 78 parts of copper and 22 parts of tin. *Imp.* free.

Bellows, an instrument for increasing the activity and heat of a fire. The familiar *B.*, with two flat boards hinged at one end, elastic leather sides, a valve in the bottom board to admit air, and a nozzle to expel it, have been known in Europe for two or three centuries. Patent *B.* have a revolving handle, which permits a continuous blast to be maintained. See BLAST, BLOWING-MACHINES, FORGE, VENTILATION.

Belt, an article of dress of various materials; thus there are sword-belts, waist-belts, cross-belts, ladies' belts, etc.—A band, usually of leather, India-rubber, or gutta-percha, which, by wheels and pulleys, connects the different rotatory parts of machinery, transmitting power with less noise and friction than accompanies the employment of toothed gearing.

Belting, the material for the fabrication of machinery belts; also machinery belts taken collectively.

Belvidere, Delaware, and Flemington R.R., from Trenton to Manunka Chunk, N. J. This line, whose offices are in Trenton, N. J., 67·82 m., with branches, 15·37 m.; total, 83·19 m., is the property of two Co.'s, the Belvidere Delaware R.R., opened in 1855, and the Flemington R.R., opened 1854. They were leased in 1876 to the Pennsylvania R.R. Co., who operates them as the Belvidere Div. of the United R.R. of N. J. *Financial Statement:* Cap. stock (Bel., Del.), $994,000; cap. stock (Flem.), $150,000; funded debt (Bel., Del.), $3,444,500; bills payable (Bel., Del.), $171,702.27; funded debt (Flem.), $250,000. To debit: Railroad (Bel., Del.), $3,114,513.31; equipment (ditto), $1,130,787.62; railroad and equipment (Flem.), $290,653.87; balance, $474,447.47. Funded debt of Bel., Del. R.R., 1st mortgage, 1852, $1,000,000, payable 1877, interest 6% (June and Dec.); 2d mortgage, 1854, $500,000, payable 1885, interest 6% (March and Sept.); 3d mortgage, 1857, $750,000, payable 1887, interest 6% (Feb. and Aug.); consolidated mortgage, 1876, $1,500,000, payable 1916, interest 7% (Jan. and July). Net earnings, 1877, $122,631.52.

Bend, a name in the leather trade for a butt or rounded crop cut in two.—A mode of fastening a rope, of which there are several kinds, as the short *B.*, fisherman's *B.*, etc.

Benedictine. A French liqueur or cordial, distilled at Fecamp, in Normandy, and somewhat resembling Chartreuse, q. v.

Bengal. See INDIA (BRITISH).

Bengal Light, or BLUE LIGHTS, a species of fire-work, which, when ignited, throws out a remarkably brilliant and penetrating light. As it contains antimony, its fumes are poisonous; it cannot, therefore, be used with safety except in the open air. It is used on ships as night signals.

Bengals, a thin slight stuff made of silk and hair for women's apparel.

Bengal Stripes. See GINGHAMS.

Benitier [Fr.]. See HOLY-WATER POT.

Benjamin. See BENZOIN.

Ben, (Oil of,) a fine colorless limpid oil obtained by expression from the decorticated seeds of the *Moringa pterygosperma*, a tree which grows in Egypt and Arabia. It is inodorous, and does not readily become rancid; hence its excellence for the manuf. of jasmine, tuberoses, and other scented oils. It is also used in medicine; and by watchmakers for lubricating watch machinery. It is imported from France.

Benzine. See BENZOLE.

Benzoin, BENJAMIN, or FRANKINCENSE, an odoriferous gum-resin, obtained in Siam and the Eastern Archipelago, from *Styrax Benzoin* (Fig. 33).

Fig. 33.—STYRAX BENZOIN.

It occurs in large masses, is quite dry, and easily pulverizable, of a brownish-red color, spotted with clear red, and, in proportion to its fineness, has intermixed a large number of tears, resembling in size and form almonds, with an even fracture, having a greasy lustre, and translucent; while the mass is opaque, uneven in its fracture, and occasionally porous. Its taste is sweetish and resinous; its smell, especially when rubbed or kindled, pleasant and balsamic. Sp. gr. 1·068. The large masses, quite opaque, of a brownish or blackish color, and destitute of white grains, is called *B. in sorts*. It is used in medicine, in perfumery, to burn in censers in Roman Catholic churches, and to yield benzoic acid. *Imp.* free, but prohibited unless it affords 80 per cent. of resin, or 12 per cent. of benzoic acid.

Benzoic acid, or *Flowers of Benzoin*, occurs in white, needle-like prisms, of a flocculent appearance when in mass, with a soft, silky lustre; taste, at first sweetish, but afterwards pungent; odor peculiar, but highly characteristic; sp. gr. 0·657. It is completely soluble in alcohol. It is used in medicine and perfumery. *Imp.* duty, 10 per cent.

Benzole, BENZINE, BENZOLINE, a highly inflammable oil obtained from coal-naphtha, of great solvent powers, which is used by manufacturers of India-rubber and gutta-percha, by chemists for making oil of bitter almonds, for illuminating purposes (then often called *gasoline*), in the preparation of varnishes, for cleaning kid gloves, for extracting grease, paint, or tar from cloth, silk fabrics, and leather, and other purposes. *Imp.* duty, 40 cts. per gal.

Berberine, a little crystalline powder obtained from the root of *Berberis vulgaris*, used as a substitute for quinine, and for coloring cottons and silks.

Bercheroot, the Russian pound, 40 of which make a Russian pood.

Bere, BIGG, one of the kinds of six-rowed barley, grown in Scotland and other northern countries, valued for its hardy properties. It is used for the distillation of whiskey.

Bergamot, the fragrant fruit of the Bergamot orange-tree (*Citrus Bergamia*), from the rind of which an essential oil of delicious quality is obtained, both by pressure and distillation. This oil is limpid, fluid, and yellowish, with a smell resembling that of oranges. Sp. gr. 0·888. It is used as a perfume.

Bergen. See Norway.

Berkowitz, or BERQUET, a Russian weight = 360 lbs. avoirdupois.

Berlin. See PRUSSIA.

Berlin Blue, a blue mellic pigment; a fine variety of the Prussian blue. *Imp.* duty, 25 per cent.

Berlin Gloves, thread or cotton gloves for summer wear.

Berlin Iron, is iron which, from its perfect fluidity when melted, admits of being cast into the most delicate forms, such as lace-work, perforated fans, bracelets, etc.

Berlin Wool, the name given to various kinds of beautifully dyed, soft, elastic worsted yarns, used by ladies for knitting and tapestry-work.

Berlin Work, a species of embroidery in colored worsteds from designs produced by Berlin artists.

Bermillians, stout linens or fustian fabrics.

Bermudas (The). See WEST INDIES.

Berries, are soft and succulent fruits, having their seed lying loosely among pulp, many of which enter into commerce, as bay-berries, juniper-berries, etc. French and Persian berries, also called yellow berries, are the small dried fruit of *Rhamnus infectorius*, used for dyeing.

Berry-Wax, same as Bayberry-Wax, (q. v.)

Bersimlichi, a kind of Greek silk used for sewing and embroidery.

Berthage, a charge made on a vessel for a position in dock or harbor.

Beryl, an ornamental stone, differing little from emerald, except in color. The emerald is green; all the varieties of other colors, tinged more or less yellow and blue, or altogether colorless, are beryls. Common form, the hexahedral prism; transparent, translucent, or opaque; lustre, vit-

reous; sp. gr. 2·75; localities, Brazil, Siberia, France, and the U. States. Such varieties of beryl as are clear, transparent, or exhibit brilliant shades of sky-blue, or mountain-green, are denominated by lapidaries *aqua-marine*, or precious beryl. They are principally brought from Brazil. They are also found at Royalston, Mass.

Beshmet, grapes made into a consistence resembling honey, a staple product of some of the mountainous districts of Asia Minor. It forms a great article of food among the Turks.

Betel, an East Indian plant (*Piper betel*), the leaf of which, mixed with the fruit of the Areca palm (*A. catechu*), commonly called betel, or pinang nut, forms a hot, acrid, and narcotic masticatory, known as *Pan* in India and the Malayan archipelago, where it forms nearly as extensive an article of commerce as tobacco in the West. All classes, male and female, chew it, and they allege that it strengthens the stomach, sweetens the breath, and preserves the teeth. It gives the lips, tongue, and teeth a reddish tinge which is esteemed ornamental.

Beton [Fr.], a kind of concrete or hydraulic cement, rendered more compact by bëing mixed with gravel, pebbles, etc., which is used in submarine works as a foundation for masonry. It is also called grubbstone mortar.

Betterave, the French name for the red beet.

Betuline, a colorless resin or gum extracted from birch bark.

Beurre, the French name for butter.

Bevel, to shape or smooth away to an angle.— A carpenter's tool to strike angles with.

Bevel Plumb-Rule, a surveyor's instrument for adjusting the face of the slopes in embankments.

Bevel-Wheel, a wheel with teeth at an angle.

Beverage, a common name for any kind of drink.

Beyrout. See TURKEY.

Bez, a cloth of native cotton-twist of various lengths, made in Turkey.

Bezoar, a morbid concretion found in the stomachs of some ruminating animals, and possessing many fanciful medical properties. It has long fallen into medical disuse in Europe, but is still highly valued in the East.

Bhand, a Surat weight of 900 lbs.

Bhang, an intoxicating drug obtained in India from the *Cannabis sativa*, or hemp plant.

Bicarbonate of Soda. See SODA.

Bice, is the name of two blue and green pigments, which are native carbonates of copper, and are used by artists. Blue *B.* is sometimes called *mountain blue*, *Hamburg blue*, and *mineral blue*. Green *B.* has also the names of *Hungarian green*, *malachite green*, *emerald green*, and *mountain green*.

Bichromate of Potash. See POTASH.

Bid, an offer made, a price tendered for an article at an auction.

Bidery-Ware, [from Bider, a city in Hindostan,] the name given to certain ornamental articles made in India of an alloy consisting of copper, lead, tin, and zinc, inlaid with silver or gold, and polished. They are greatly admired for the elegance of their form, as well as for the gracefulness of the patterns with which their surface is engraved.

Bigarreau, a name for the white-heart cherry, derived from the French.

Bigg. See BERE.

Bighera, a name for thread lace in Italy.

Bijou, a gem, a small jewel.

Bijouterie, jewelry, trinkets, etc.

Bijoutier, the French name for jeweler.

Bilan, the French name for an account-book; a balance-sheet of debtor and creditor.

Bilander, BYLANDER, a small coasting-vessel with two masts, resembling a tray.

Bilge, the swell or protuberant part of a cask.— The projecting parts of a ship's bottom, or floor on each side of the keel.

Bill, a formal statement or declaration in writing; an account rendered; an acceptance; an account presented for payment; the formal statement in detail of a purchase: when one merchant purchases a line of goods from another, he makes a *bill* with him; a promissory note, a foreign or inland bill of exchange, and the bank-notes or circulating issues of banks, are also called *bills*. — A term among letter-founders for a fount of type.

Bill-Book, a book in which entry is made of the particulars of bills and notes, in favor or against a person or firm.

Bill-Broker, one who deals in discounts.

Bill-Head, a printed form with name, address, or business, used for making out accounts from the books.

Bill-Hook, the name in the West Indies for a small curved hand-chopper, or reaper, for cutting sugar-canes, brushwood, etc.

Billiard-Balls, red and white globes of ivory with which the game of billiards is played.

Billiard - Cloths, green woollen broadcloth, manufactured to cover a billiard-table, which are piece dyed, and 72 to 81 in. wide.

Billiard-Cue, the rod or stick with which the billiard-balls are struck.

Billiard-Table, a table usually made of slate covered with a cloth, having padded cushions and sometimes netted bags at the corners, and used for playing the game of billiards, with ivory balls and a cue.

Billion, a term used to denote a thousand millions, or 1,000,000,000, according to the French method, used on the continent of Europe and in the U. States. The English use the same word to denote a million of millions, expressed by the figures 1,000,000,000,000.

Bill of Entry, a note of the particulars of goods entered at the custom-house, whether imported or intended for exportation. See ENTRY.

Bill of Exchange, is a written order directing one party to pay a sum of money to another— either the person who gives the order or some third person — at some day fixed or ascertainable. The individual who issues the order is called the *drawer*; the person to whom it is addressed is called the *drawee*, until he consents to honor the draft or obey the order, after which he is called the *acceptor*. The bill may be passed from hand to hand by delivery or endorsement, according to circumstances (see ENDORSEMENT), and in the latter case, the person who makes one is called the *endorser*, and the person who receives, the *endorsee*. He who is in the legal possession of the bill, and the obligation contained in it, is called the *holder* or *payee*. *B. of E.*, as one of the most prompt and powerful engines in conducting trade, are peculiarly privileged by the law, requiring few words and no solemnities of execution. There is no particular form for a *B. of E.* required by law, further than that the mandate to pay in

money be distinct, and the person who is to pay, the person who is to receive, and the time of payment shall be ascertainable beyond a doubt. A mere request to pay money is not a bill, for the drawee is presumed to be the drawer's debtor, and the bill must be an absolute assignment of the debt; nor is an acknowledgment of debt, or a promise to pay which is part of a bargain for the sale of goods. When a bill has all the apparent requisites, though an expression which takes it out of this sphere of document be fraudulently introduced to escape observation, it would appear that it will still be held a bill against the committer of the fault. This was held where the word "at" was introduced in very small letters within the tail of the S of Sir in the address to the drawee. An order to pay in anything other than cash is not a bill, as "in U. S. bonds," "in bank-notes," etc. The amount must be specific, and therefore the addition of the words "or whatever else may be due," would vitiate the bill. The money must be payable "at all events," and any condition which may affect the certainty of the declared intention of the parties to hold it an absolute order to pay at some time or other, will vitiate the bill, as, when A B agrees to pay when C D shall marry, or at a certain time if C D be alive then. From the time when a bill is drawn and delivered, it becomes, by the operation of the contract of mandate, a document of debt in favor of the payee, for he who in fulfilment of an obligation gives an order to another to pay, becomes himself responsible on that other not performing. If the drawee is not indebted to the drawer, or, as it is commonly termed, has "no effects," he will not be liable, even though he has accepted, to the drawer, but third parties who have received the paper for value, are not affected by the obligation between the original parties, otherwise than as they appear on the bill. (See ACCOMMODATION BILL.) A drawer generally appends his usual signature at the foot of the mandate. The acceptor to whom it is addressed generally signs below the drawer, either with or without the word "accepted" before his name. An endorser commonly puts his name on the back, with or without a direction to pay to a particular person. It is common practice to mention on the face of a bill that it is "for value received;" but this is not necessary, and in the general case value is presumed, and need not be proved by the party pleading it unless where a bill has been originally obtained through fraud, or in that of a bill which has been stolen. A person who delivers a blank bill, drawn or accepted, is liable for whatever sum may be filled in. Bills may be subscribed by procuration. Whoever takes such a bill, however, must assure himself of the procurator or agent's authority to grant it, for if he exceed his powers, the bill will not be effectual against his employer. A person who signs "per procuration" should mention that he does so, otherwise he will be personally liable.

B. of E. are divided into foreign and inland; the former is drawn in one country and payable in another, the latter is drawn and payable in the same country. In the U. States, a bill drawn in a State on a person resident in another, is considered an inland bill. In most essential points, the laws as to foreign and inland bills are analogous to each other. Foreign bills are generally drawn in several sets or parts, transmitted by different conveyances, in order that if any one or more should be lost, another may arrive safe for being presented. Each bears that it is payable on the others not being paid, as "pay this my second bill of exchange, first and third of the same tenor and date not being paid," etc. The drawee of a bill drawn in sets should only accept one of the sets, as it is held that if he accept one set, and afterwards pay another set, he will not be liberated from the claim of a *bonâ fide* holder of the accepted ones. The various parties upon a bill, besides the acceptor, endorsers, drawers, and others, become liable for its payment on failure of the acceptor. The acceptor's failure to pay is commonly said to be an act of *dishonor*. If the drawee refuse acceptance, this likewise is dishonor, and is held to be such a prospective refusal of payment as entitles the holder to claim immediately from the drawer, or, if there be an endorser, on that endorser, who has recourse on the drawer; but to entitle him thus to record on the original parties, there are obligations on the holder, without performing which he is held not to have duly negotiated. He must present the bill for acceptance and for payment on the proper occasions. (See PRESENTMENT.) He must give notice of non-acceptance or of non-payment; and usually he must have the bill protested. (See NOTICE, PROTEST.) To avoid expenses, in case the drawee refuse to accept, the drawer of a foreign bill may require the holder to apply to a third person named in the bill, which is usually made thus: "In case of need, apply to Messrs. —— at ——." The drawer may also add a direction, that in case the bill is dishonored, it shall be returned without protest, by subscribing the words, *return without protest*, or *retour sans protêt*. When the drawer of the bill is debtor to the drawee, it is usual to insert in the bill these words: and *put it to my account;* but when the drawee or the person to whom it is directed is debtor to the drawer, then he inserts: and *put it to your account;* and when a third person is debtor to the drawee, it is sometimes expressed thus: and *put it to the account of A. B.* The foregoing forms, however, though in frequent use, are not necessary. See DAYS OF GRACE.

FORM OF INLAND BILL OF EXCHANGE.

$100. NEW YORK, March 27th, 1879.

Three months after date, pay to J. Hopecraft or order, ONE HUNDRED DOLLARS, for value received, and charge the same to account of WM. RUSSELL.

To Robert Bruce & Co., Baltimore.

N. B. — *This admits of the following variations, according to circumstances: Instead of "three months after date," it may be "at sight," or at such time "after sight," or at such a specified time, or "on demand," and the instruction to pay may be "to me or order."*

FORM OF A FOREIGN BILL OF EXCHANGE.

Fr. 1,000. CHICAGO, March 27th, 1879.

Sixty days after sight of this FIRST of exchange (second and third unpaid), pay to the order of A. Vuillot, ONE THOUSAND FRANCS, value received, and charge to account, with or without advice of

JOHN WILLIAMSON.

To E. W. Davies & Co., Paris.

N. B. — *This form admits of the same variations as are exhibited in the above inland bill.*

Bill of Health. See QUARANTINE.

Bill of Lading, is a certified document or receipt from the master or mate of a ship for goods shipped. It is a negotiable instrument. Several parts or copies are made out, one for the use of the master, the others for the shipper, who, by means of them, can give a title to the consignee

or other person for whom the goods are destined, to receive them. The following is an ordinary form of a bill of lading:

SHIPPED in good order and well-conditioned, by Robert Davidson & Co., in and upon the good ship called *Emma*, whereof Rudolph Thomitz is master for the present voyage, now lying at the port of Baltimore, and bound for London, fifty cases canned oysters, being marked and numbered as in the margin, and are to be delivered in the like good order and well-conditioned at the aforesaid port of London, the dangers of the sea only excepted, unto Mr. Henry Lloyd, or to his assigns, he or them paying freight for the said goods, at the rate of ——— per ton, with primage and average accustomed. In witness whereof, the master of the said ship hath affirmed to three bills of lading, all of this tenor and date, one of which bills being accomplished, the others to stand void.

A
B ◇ D
C
1 to 50

Dated in Baltimore, the 27th day of March, 1879.

RUDOLPH THOMITZ.

When the goods are put on board, a receipt is generally given by the master; this is afterwards exchanged by the holder for the bill of lading. The bill has two objects. It fixes the amount and condition of the goods received, and for which the master is responsible (see AFFREIGHTMENT), and conveys a title to demand delivery. It may, like a bill of exchange, be negotiated by simple endorsement and delivery, which will carry a right to the goods. No intimation to the shipmaster is necessary, he being bound to deliver to the holder.

Bill of Parcels, is an account of goods sold given by the seller to the purchaser. It usually contains the description, quantity, price, and amount of each article; with the statement of the place, date, and terms of credit.

Bill of Sale, a writing made by the seller of goods to the purchaser, by which the seller transfers and conveys away the right and interest he has in the goods therein named.

Bill of Sight, in England, a temporary form of entry at the custom-house, permitting goods, of which the consignee ignores the quantity and quality, to be provisionally landed for examination.

Billon, the French name for gold or silver alloyed with copper, and coined below the standard value.

Bills Payable, notes, bills and other written promises or engagements to pay, outstanding against an individual or firm.

Bills Receivable, the unpaid notes, bills, etc., claimable by an individual or firm.

Billy, a slubbing frame in a woollen factory, generally containing 60 spindles, when the cardings are joined, to make a continuous yarn, drawn out slightly twisted, and wound in bobbins.

Bimbeloterie, a French term for toys and playthings in various materials, children's hand-carriages, etc.

Bind, a term applied, in the fish trade, to 250 eels or ten strikes, each containing a quarter of a hundred.

Binnacle, the case in which the mariner's compass is secured on board ship, within sight of the helmsman or man at the wheel.

Birambi, the fruit of *Averrhoa Bilimbi*, a shrub from Berbice, which makes an excellent pickle and a delicious preserve.

Birch [Fr. *bouleau*], a graceful forest tree, of which there are several species. The Norway *B.*, *Betula alba* (Fig. 34), furnishes an inferior timber used for common articles of furniture and in ship-building. The bark yields a yellow dye, and also an essential oil prepared and used in Russia, and which is said to impart the peculiar odor to Russia leather. The black *B.* of North America, *Betula lenta*, is a compact, handsome wood, but it soon decays. It is used for flooring and keelsons, and is largely exported to England. The wood of several other species, found in the N. Eastern and Western States, is used for many economical purposes, as for herring-barrels and butter-tubs, turnery-ware, etc.

Fig. 34. — NORWAY BIRCH.

Birch-Broom, a common sweeping-broom made from the young shoots of twigs of the birch-tree.

Birch-Wine, a medicinal drink made from the sap of the birch-tree, which is said to possess antiscorbutic and diuretic properties.

Bird-Call, a kind of whistle.

Bird-Fancier, a dealer in cage-birds, pigeons, etc.

Bird-Lime, an adhesive, tenacious, vegetable product, obtained principally from the inner bark of the holly, the mistletoe, and the distaff thistle, by bruising, long boiling in water, and fermentation, the mash being again boiled in water and evaporated to a proper consistence. It is of a greenish color, odor resembling that of linseed-oil, and having a bitter taste. It is employed by the bird-catcher to entangle the feet of his prey at some selected spot; and in India it is used to destroy insects.

Bird-Seed, canary, hemp, millet, and other small seeds used for feeding cage-birds.

Birds. Singing and other birds, and land- and water-fowls, and stuffed birds, do not pay duty on importation into the U. States. If, however, they are imported in such quantities as to authorize the belief that they are intended for sale, the duty is 20 per cent.

Bird's-Eye, a fine kind of tobacco partly made from the stalks of the leaves of certain varieties of

Nicotiana.—Artificial glass eyes for stuffed birds. They are extensively manufactured.—A pattern consisting of small circular spots.

Bird's-Eye Crape, a thin material made for the East Indian markets.

Bird's-Eye Diaper, a kind of towelling.

Bird's-Eye Maple, an estimated variegated cabinet wood, arising from an accidental form in the arrangement of the fibre of the rock or sugar maple, *Acer saccharinum*, of America. Curled maple consists of undulations in the same wood.

Bird's-Nest (Edible), the nest of the sea-swallow, *Hirundo esculenta*, of the Malay Archipelago, a bird of the size of the common martin. It builds its nest of a gelatinous substance which it is said to derive from a sea-weed. This weed is swallowed and partly digested, and then disgorged and fashioned into a nest as large as a common coffee-cup. The taste of dishes prepared from these nests is said to be insipid, but the Chinese prize them, probably for their supposed tonic and aphrodisiac powers. They are said to be worth in China twice their weight in silver.

Birds of Paradise, a genus of birds (*Paradisea*) remarkable for the extreme elegance and richness of their feathers (Fig. 35), which are employed for the same purposes as the feathers of the ostrich. The skins and plumage of these birds are imported almost wholly from Batavia, and realize a high price. In preparing them for the market, the bird is disembowelled, smoked, and deprived of its legs. The true wings, which are not so brilliant as the other feathers, are also frequently removed.

Fig. 35.—Bird of Paradise.

Birth, or Berth, a nautical term applied to the position in which a ship is moored or anchored, as a port birth, good birth, wide birth, etc.; also a small crib or cabin built up against the ship's side.

Bisa, a Burmese coin, worth about 27½ cts.

Biscuit, [Fr. *biscuit;* Ger. *zweibach;* It. *biscotto galetta;* Por. *biscoito;* Sp. *bizcocho galleta*,] a kind of bread chiefly used by seamen, which is baked in the form of flat cakes in order to insure their being deprived of moisture, and so preserved from becoming mouldy during the continuance of long voyages. They are mostly made of pollard, or an inferior kind of flour; but there are some white varieties for cabin use, and a kind also called pilot *B.* The small American cracker is a superior kind of *B.* There are many fancy *B.* sold by pastry-cooks, such as captains', arrow-root, rice, wine *B.*, etc.—A term given to white porcelain after it has been baked in the oven, and before it receives the glaze. From it are made groups of miniature statuary, which are baked two times, and are also called *B.*

Bishop, is a beverage composed of hot or cold burgundy, claret, or other red wine, poured upon ripe bitter oranges, and then adding sugar and spices according to taste. It is drunk either hot or cold, and its quality depends entirely upon the excellence of the wine employed. In order to make bishop properly, the oranges ought to be well selected, and the white part between the peel and the pulp rejected. It is called *cardinal* when made with white wine; and *pope*, when made with tokay.

Bismer, a Danish weight = 13⅛ lbs.

Bismuth, [Fr. *bismuth;* Ger. *wismuth*,] a brittle yellowish-white metal, of a foliated texture, and peculiar odor and taste. Sp. gr. 9·83. In hardness it stands between copper and lead, is scarcely malleable, breaks under the hammer, and cannot be drawn into wire. *B.* is a very rare metal; it is principally obtained in a combined state, from the mines of Schneeberg, in Saxony. As met with in commerce, it is impure, generally containing iron and arsenic, and probably some other metals. Most metallic substances unite with *B.*, and are rendered by it more fusible than before; hence it is used in making solder, printers' types, pewter, etc. As a medicine, *B.* acts as a tonic and anti-spasmodic. In the arts it is often called *tin glass.* The sub-nitrate of *B.* is a tasteless, heavy powder of pure white color, called *pearl white, pearl powder, blanc de fard,* etc.; it is used as a pigment and as a cosmetic, extensively used by ladies both on and off the stage. It is imported from France, and cost in average in New York, $8 per lb. *Imp.* duty: (metal), free; (oxide), 20 per cent.; (sub-nitrate), 40 per cent.

Bistort-Root, is the root of *Polygona bistorta*, a powerful astringent.

Bistouri, a surgeon's incision knife, of which there are several forms.

Bistre, is a brown pigment useful for water-color drawings; it is made from the soot of various kinds of burnt wood.

Bit, a carpenter's boring instrument which fits into a stock or handle; a drill.—That part of a key which is fitted to the shank and in which the wards are cut.—The hammer used by masons for rough picking or dressing granite.—The iron mouth-piece of a bridle, of which there are several kinds, as snaffles, curbs, etc.—A small silver coin, formerly circulating to some extent in the West Indies, equal to two Spanish reals vellar, or 10 cts.

Bittern, the residual liquor after the separation of the salt from the water of a brine-spring, from which bromine is made.—A composition of *Cocculus Indicus*, quassia, liquorice, tobacco, and sulphate of iron, said to be used by brewers in adulterating beer.

Bitters, a stomachic drink for promoting digestion and improving the appetite, consisting of spirits in which wormwood, gentian, chamomile, angelica, bitter barks, or some other ingredients have been steeped. The best *B.* are those prepared in New York with Angostura bark. *Imp.* duty as Alcohol, q. v.

Bitter Salt, Epsom salts, the sulphate of magnesia.

Bitter-Sweet, is a wild hedge plant, *Solanum dulcamara*, which is a dangerous narcotic, but used medicinally with advantage.—A variety of apple.

Bitterwood, a tree of the West Indies, *Xylopia glabra*, all the parts of which are aromatic and intensely bitter.

Bitts, are two strong but short pieces of timber

projecting vertically from the deck of a vessel, in the fore-part, close to either side, and strongly secured to the beams on which the deck-planks are laid. They are placed in pairs, and are principally used for fastening the cable when the ship is at anchor or moored alongside a quay. There are many kinds of *B.* used for different purposes in ship-building, and distinguished by various names.

Bitumen, or MINERAL PITCH, a solidified earth-oil, or naphtha, which constitutes the inflammable principle of coal. See ASPHALTUM.

Bituminous Coal. See COAL.

Black, the darkest of colors, produced by the total absorption of all the rays of light. It is the opposite of white. The principal substances sold and used as paints and dyes for producing black are vegetable blue-black, ivory-black, cork-black, lamp-black, black lead, Frankfort-black, aniline black, Spanish black, and Indian ink.

Black Amber, a German name for pitch-coal, which is found accompanying amber, and of which jet-like ornaments are manufactured.

Black Ash, an impure carbonate of soda, which, when refined, is called white ash. — The wood of *Fraxinus sambucifolia.*

Black-Ball, a blacking composition used for polishing shoes.

Blackberry, the fruit of the bramble, *Rubus fruticosus.* This fruit is not a berry, but a collection of drupes; it is edible and pleasant, and is used for pies and puddings, etc.

Black Cattle, is a name applied collectively to the large description of domestic animals, horses, bulls, oxen, cows, etc.

Black-Chalk, a kind of black clay, containing a large quantity of carbon, and found in several parts of Europe. It is also manuf. with ivory-black and fine clay. The fine sorts are made into artists' crayons, and used for drawing on paper.

Black Cherry, the wood of a lofty tree of N. America, the *Cerasus serotina*, which is extensively used in cabinet-work.

Blackcock, a kind of grouse, the *Tetrao tetrix.*

Black Currants. See CURRANTS.

Black Draught, a popular purgative medicine, composed of epsom salts, senna, liquorice, and aromatics.

Black-Ebony. See EBONY.

Black-Flux, a preparation of cream of tartar ignited in a close crucible; a carbonate of potash and charcoal.

Blacking, a polishing paste or liquid, the chief ingredients of which are powdered bone black, sperm or other oil, molasses, sour beer or vinegar, oil of vitriol, and copperas. It is used for blacking and polishing boots and shoes. The *Acme blacking*, recently patented and made in Philadelphia, is said to give a beautiful polish without brushing, to retain its lustre for weeks and preserve the leather. Many thousands of tons of blacking are annually made in the States. *Imp.* duty, 30 per cent.

Black Iron, a name given to malleable iron, in contradistinction with that which is tinned, and called white-iron.

Black Jack, a drinking-cup of tin or leather. — A mining name for zinc blende or sulphide of zinc. — Caramel or burnt sugar, which is used to color spirits, vinegar, coffee, etc. — A trade name for adulterated butter.

Black Japan, a varnishing material made with tar and alcohol, or with lamp-black and resin, used in house and carriage painting. It is a liquid of about the same consistency as varnish of a jet black color; it has no grains, as the mixture of a pigment and varnish, and its flowing qualities are excellent. It was formerly imported from England. It is now successfully manuf. in New York, where it is known as Valentine's Black Japan.

Black-Lead. See PLUMBAGO.

Black Letter, in printing, an old English or modern Gothic type.

Black Oak. See QUERCITRON.

Black Plates, a commercial name for thin sheets of iron prepared for coating with tin.

Black Pudding, [Fr. *boudin*,] a kind of sausage, made of pig or sheep's blood, groats, suet, etc., enclosed in the dried intestines of swine and boiled. In America, they can be procured only in French shops.

Blacks, a name for ink used in copper-plate printing, prepared from the charred husks of the grape and residue of the wine-press.

Black Salts, a name for the ordinary potash in a crude and impure state.

Blacksmith, a worker in iron; one engaged in beating and shaping malleable iron.

Black Spruce. See SPRUCE.

Black Strape, a name for bad liquor and inferior wines.

Black Tea. See TEA.

Black Tin, tin ore, beaten into a black and fine powder like sand for smelting.

Black Wad, an ore of manganese, used as a dryer for painters' colors.

Black Walnut. See WALNUT.

Bladder Green, a pigment prepared from Persian berries.

Bladders, the urinary vessels of oxen, pigs, calves, and sheep, which are chemically prepared for holding lard, and other purposes. Quantities of *B.* are exported to England, packed in salt or pickle.

Blade, the flat, cutting part of a sword or knife, scissors, etc.

Blades, a commercial name for the four large shell plates on the sides, and the five large ones from the middle of the carapau of the sea-turtle: these yield the best tortoise-shell.

Blanca, a petty money of account in Malaga, 68 making one real villou = 5 cts.

Blanc de Fard. See BISMUTH.

Blanchimeter, an instrument for measuring the bleaching power of chloride of lime and potash.

Blanching, the process of whitening anything, such as removing the skin of almonds; covering iron plates with a solution of tin, etc.

Blandurillo, a fine, soft pomatum made in Spain.

Blank-Books, account-books, letter-books, pass-books or memoranda, made of ruled or unruled writing-paper, and bound with flexible or stiff covers. They are manufactured and sold by stationers.

Blank Credit, an authorized permission given to draw on an individual or firm to a certain amount.

Blanketing, a closely woven or felted woollen stuff used for printing-machines. *Imp.* duty, 20 cts. per lb. and 35 per cent.

Blankets, soft, loosely-woven stuff pieces, used for bed-covering or wrappers. The long staple is

the wool generally used. *B.* are made also of cotton warps and wool. They are woven in widths varying from 4 to 20 quarters, and in lengths of webs from 60 to 100 yards. They are usually sold by the pound. They are extensively manuf. in Yorkshire, England, in France, in Germany, and in the U. States. *Imp.* duty (value not over 40 cts. per lb.), 20 cts. per lb. and 35 per cent.; (over 40 cts. and not over 60 cts.) 35 cts. per lb. and 35 per cent.; (over 60 cts. and not over 80 cts.) 40 cts. per lb. and 35 per cent.; (over 80 cts. per lb.) 50 cts. per lb. and 35 per cent.

Blanquette, a delicate sort of French white wine. The best is the sparkling *B.*, made at Limoux, dept. Aude, from muskat grape.

Blast, air introduced into a furnace artificially.

Blast-Furnace, an enclosed fire-place where an extra degree of heat is generated by a powerful forge-bellows.

Blasting, a speedy process for removing or detaching heavy masses of stone, earth, etc., by exploding charges of gunpowder, nitro-glycerine, or dynamite.

Blasting-Powder, a coarse kind of powder for mining and quarrying purposes.

Blast-Pipe, the tube in a locomotive, which carries off the waste steam, and produces a greater draught for the fire.

Blast-Regulator, a cylinder of iron for holding and conveying air to a blast-furnace.

Blay Linens, linens beetled in the manufacture, and slate colored.

Blé, the French name for wheat, but chiefly applied to wheat.

Bleaching, the chemical process of removing the color of cloth or vegetable substances. This important process, though applied also to flax and other fibrous materials, has received its chief development in connection with cotton. As a distinct branch of manuf., *B.* goes through three series of processes — the removal of dirty, greasy, resinous, and starchy particles; the removal of color, and the glossing and folding of the bleached cloth.—*Singering.* Woven cottons always exhibit a downy-surface of minute fibres when they leave the loom. In order to remove these fibres, the cloth is passed over a singering machine, which consists of a plate or cylinder of copper, kept nearly red-hot by gas-jets underneath. The pieces of cloth are tacked temporarily together, and wound in an enormous length upon a roller, from which the cloth travels over the singering cylinder, and is received upon another roller.—*Boiling.* The cloth is next boiled in a boiler called a *keir*, which is so constructed as to shower down a stream of liquid in the form of a spray on the cloth. The liquid is a hot solution of lime or some other alkaline agent, and the purpose of the boiling is to remove dirt and grease. — *Washing.* The washing-machine has a water-trough and two wooden squeezing-rollers. The cloth passes continuously through the water in the trough between the rollers, which revolve 100 times a minute, and squeeze the cloth as it passes. The machine has, in many establishments, superseded the *dash-wheel* formerly employed; some of them are so large that they will wash 12,000 yards per hour. — *Chemicking.* This, also called *scouring*, is a second washing with smaller rollers, and some kind of acid in the water. It is, in fact, the *bleaching* process; chlorine, developed from the chloride of lime steeped in the liquid, removes the colors from the cloth. — *Squeezing.* After the cloth is thoroughly bleached, the greater part of the liquid is expelled from it by the squeezing-machine — one of the many varieties in which the cloth is passed between two smooth rollers, and pressed as it passes. — *Drying.* The cloth passes over a series of steam-heated cylinders in the drying-machine, becoming quite dry before it leaves the last of them, although not smooth. — *Mangling.* If the cloth is to be printed — for printing muslins, chintzes, etc. — it goes to the print-works after drying; but if it is to be sold as calico or other white cloth, it requires a few finishing processes, of which mangling is one. The cloth passes through a cistern of water, and is then dragged between two rollers, which flatten and equalize the threads. — *Starching.* When flattened and equalized in surface, the cloth, wound upon a cylinder, passes through the starching-machine, which has a roller dipping into a trough of starch, and other rollers to press the superfluous starch out of the cloth. Flour paste, sometimes weighted with ground porcelain clay, and sometimes tinted with a little blue, is the composition here employed.—*Calendering.* It is not all white goods that require to have a gloss given to them; but when such is the case, the calendering or glazing machine is employed (see CALENDERING).—*Making up.* Lastly (that is, unless the dyeing or printing is to be immediately done in the same establishment), the cloth is passed through a machine in which rollers are placed at definite distances apart, so as to form a self-measuring apparatus; and then the cloth is packed into bales or other parcels, according to the market to which it is to be sent. A moderate but efficient plant for an establishment adequate to bleaching 2,500 pieces of 20 yards each in a week, will cost about $25,000. For other processes of bleaching, see CANDLES, PAPER, SILK, STRAW PLAIT, WOOLLENS, etc.

Bleaching Powder, the name given to chloride of lime, which is the chief substance employed in bleaching. It is prepared by passing chlorine into chambers containing fresh-slaked lime in fine powder, by which the gas is copiously absorbed, with extrication of heat. It is a dry, white powder, possessing a faint odor of chlorine, and a strong, penetrating taste. When agitated with water, a portion is dissolved; and the solution, called *bleaching liquor*, contains both chlorine and lime. Its bleaching power, and consequently its commercial value, may be estimated by its action upon a solution of indigo of known strength. Chlorine of lime is also used for fumigation, from its possessing the property, when exposed to air, of checking contagion or destroying noxious effluvia. The chief seats of the manuf. are Glasgow (Scotland), and Newcastle-on-Tyne and Lancashire (England), from where enormous quantities are annually exported to the U. States, our imports for the year 1878 amounting to 49,285,054 lbs., valued $598,813. *Imp.* free. — Some other bleaching powders, made of some of the magnesian salts, are coming to a certain extent into use.

Bleak. See PEARLS (ARTIFICIAL).

Blende, the Black Jack of miners, a native sulphuret of zinc, of little value, owing to the difficulty of extracting the metal from the ore.

Bleu de Paris, BLEU DE LYONS. See ANILINE (BLUE).

Bley, the German name for lead, *bleyglotte* being litharge, and *bleyweess* white lead.

Blind, a sun-screen or shade for a window, fitted within or without, and made of different kinds. A common inside window-*B.* is a plain hanging of union holland or linen; a wire *B.* is a short, transparent frame of woven wire, gauze, or perforated zinc, painted, which is either plain, or lettered and figured. Outside window-*B.* are known as Spanish, Florentine, Venetian, dwarf, spring-patent, or common roller. There are also spring-*B.* for store-fronts and sky-lights, and iron rolling *B.* for shop-windows.

Blinkers, are square pieces of leather fastened to the head-stall of a horse to make him look before him instead of aside.

Blistering-Fly. See CANTHARIDES.

Blistering-Plaster, a preparation of powdered cantharides upon adhesive plaster, to raise a blister on the skin.

Blister Steel, wrought-iron which has blisters on the surface, owing to the evolution of gas from the interior of the bar.

Bloater, a commercial name for a slightly-cured and smoked herring. *B.* are made into a paste for a breakfast relish.

Block, a shaped piece of wood containing a sheave traversing on a spindle for passing ropes through. Pulley-blocks for naval and shore use are made by means of a complicated system of machinery invented in England in 1808. Blocks of every description are extensively manuf. in the U. States, at Boston, Providence, and New York. The working of a triple block, in its simplest form, is illustrated in Fig. 36.—The wooden mould on which hats are formed.—A mass of buildings enclosed between four streets.

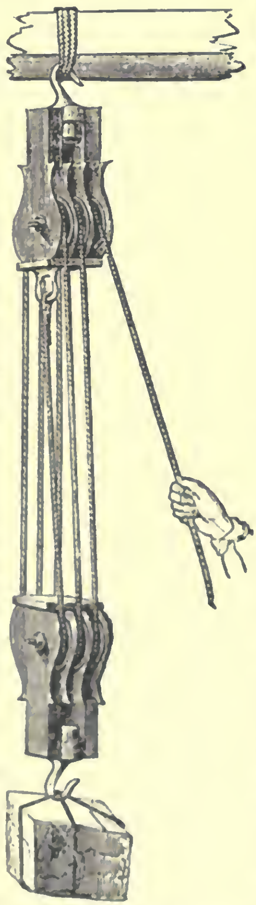


Fig. 36.—TRIPLE BLOCK.

Blockade, the official closing of a port or coast during war, by guarding and watching it with vessels of war to prevent commercial intercourse. Due notice is always legally given by proclamation to the mercantile world of the commencement and raising of a blockade. To be sufficient, the *B.* must be effective and known. The government of the U.States has uniformly insisted that the *B.* should be made effective by the presence of a competent force stationed and present at or near the entrance of the port. A violation may be by going into the place blockaded, or by coming out of it with a cargo laden after the commencement of the *B.* Also placing himself so near a blockaded port as to be in a condition to slip in without observation, is a violation of the *B.*, and raises the presumption of a criminal intent. When a ship has contracted guilt by breach of the *B.*, she may be taken at any time before the end of her voyage. When taken, the ship is confiscated; and the cargo is always, *prima facie*, implicated in the guilt of the owner or master of the ship; and the burden of rebutting the presumption that the vessel was going in for the benefit of the cargo, and with the direction of the owners, rests with them.

Block Tin, tin cast into blocks and ingots; tin ore which has been treated with copper and sulphuric acid, and is ready for smelting. A block of tin weighs from 375 to 400 lbs.

Blonde, a choice kind of silk lace. There are both black and white *B.*, which again are either real or in imitation. The best of the former are imported from France.

Blood, the fluid which circulates in the heart and blood-vessels of animals, which is used very largely in Europe, and to a small extent in the U. States, for many commercial purposes: it is stirred and run into casks for the use of sugar refiners; it is made into animal charcoal; coagulated, it is sold to calico-printers for dyeing Turkey-red, and is chemically prepared for printers' use. Albumen is made from blood. In some of the agricultural districts it is employed as a fertilizer of land.

Blood-Stone, a hard species of chalcedony, colored with numerous bright-red spots like drops of blood; it is called also heliotrope and oriental jasper, and is used for rings, etc. The best comes from India.—A species of hard hematite used as a burnisher in several trades.

Bloom, a name given to the yellowish fawn-colored deposit from the tanning liquor on the surface of the leather, and penetrating to a slight depth.—A technical term for a mass of iron taken out of the furnace to be hammered.

Bloom Raisins, a fine quality of sun-dried grapes.

Blotting Book, a book or pad with sheets of unsized paper for drying the ink on newly-written documents.

Blotting-Paper, unsized paper used for drying inked manuscripts. It is either white or colored, and some is specially prepared for chemical purposes.

Blouse, a sort of smock-frock or outer garment, worn by workmen in France, Belgium, etc.

Blowing-Machine. Besides the simple apparatus described under BELLOWS, many other forms of *B.-M.* have been devised. Vaughan's machine consists of two square boxes placed side by side, with a crank, a pipe, a piston, and other apparatus for producing a blast with the boxes alternately. In another arrangement, two vertical cylinders, with weighted pistons worked from the beam of a steam-engine, cause air to be driven from the first to the second, and then expelled with augmented force from the latter. In some of the *B.-M.* now made, the working of pistons by steam-power causes an immense quantity of air to be forced through tubes. See FORGE, HOT-BLAST, VENTILATING FAN, etc.

Blow-Pipe, [Fr. *chalumeau;* Ger. *löthrohr*,] a small pipe for directing a blast of air into a flame,

to increase the intensity of the heat. It is variously formed, but has always a mouth-pipe to place between the lips. Much art is required to direct the blast of air from the lungs in a proper manner; but when well managed, this blast raises the temperature of a flame to a very high degree, thereby facilitating many of the processes in soldering jewelry, gold and silversmith's work, enamels, glass-blowing, etc. A still more intense heat is produced by the oxyhydrogen blow-pipe.

Blow-Tubes, in the glass manuf., hollow iron rods 5 or 6 feet long, with which the workmen gather up the fluid metal from the pots, to blow and form it into desired shape.

Blubber. See Whale Oil.

Blue, the color of the sky. The principal *B.* pigments are: Ultramarine, Prussian *B.*, *B.* verditer, bice, cobalt *B.*, and iron *B.* The principal *B.* dyes are aniline *B.*, indigo, and Prussian *B.* Those and all other *B.* pigments and dyes are briefly noticed under their proper headings.

Blue-Backs, a name for the North American herring, *Clupea elongata.*

Blue Clay, a kind of clay formed of a very fine pulverized slate.

Blue Copper, an ore of copper, of an indigo-blue color.

Blue Ink. See Ink.

Blue-John, a name, in England, for an esteemed variety of Derbyshire marble, which is worked up into vases and other ornaments.

Blue Lead. See Galena.

Blue Light, a kind of firework or night-signal, which throws out a vivid light visible at a great distance.

Blue Pill, a medicinal preparation of mercury with confection of roses, liquorice root, and other substances.

Blue Stone, a common name for sulphate of copper.

Blue Verditer. See Verditer.

Blunk, a Scotch name for heavy cotton cloth.

Board, a term in carpentry for all timber of any length or width, sawn into a less thickness than 1¼ to 1½ inch; when above that thickness, it is called a plank. — A managing committee or body of directors. — The deck of a ship, as goods delivered *on board* a ship; to go a *board*, to enter a ship.

Boarding-Officer, a custom-house officer, whose duty is to go on board vessels on their arrival in port.

Board of Trade, in England, an official department branch of the government, having jurisdiction over the trade and navigation of the country. It consists of a President, and Vice-President, and the Board are termed the Lords Commissioners of the Privy Council of Trade. — In the U. States, a voluntary association of business men which, in most large towns, are organized to promote the financial and commercial interests of the place, and to consider such questions with regard to railroad and water communication, foreign commerce, banking, insurance, exchange, supply and demand, etc., as may from time to time demand their attention. See Chamber of Commerce.

Boat, a small open or decked vessel, usually propelled by oars. There are numerous kinds of boats, the construction and names of which differ, according to the service required of them. See Barge, Coracle, Cutter, Gig, Jolly-Boat, Launch, Long-Boat, Pinnacle, Skiff, Wager-Boat, Wherry, Yawl, etc.

Boatswain, in a merchant ship, a subordinate officer having charge of the sails and ropes and other gear.

Bobbin, a package or hank of Russian flax, made up according to quality in 6, 9, or 12 heads. — A wooden pin to wind thread on. — The brass reel or winder of a lace machine, with a narrow hollow surface for receiving the thread.

Bobbin-Net, a machine-made lace.

Bobbin-Net Machine, a very complicated piece of machinery for making lace net—the mere technical names of parts furnishing quite a long list: carriages, combs, bobbins, point-bars, needles, thread-beams, lace-beams, rollers, guide-bars, slit-plates, etc. In principle, the thread that makes the bobbin-net is supplied partly from bobbins, and partly from a warp. The bobbins are very peculiar, being delicately-shaped pieces of brass, so thin as to pass between the threads of a warp; there are more than 1,000 such bobbins in a large machine, and they swing, in a peculiar pendulum-like manner, to and fro between the warp threads, in such a way as to twist the weft round the warp. The machine-net, like the pillow-lace, varies in the shape and size of the mesh, the thickness and compactness of the thread, and the degree of ornamentation applied to the ground. *Broad-net* is woven the whole width of the machine; *quillings*, or narrow strips, are made several at a time, side by side in the same machine. In *fancy-net* the pattern is often worked in with thicker gimp by the Jacquard machine; but sometimes the net is made plain, and the pattern afterwards put in by hand. *Lace-running* is the name given to this net-embroidering by hand. *Lace-mending* is a special kind of needle-work to restore broken or torn meshes.

Bobstays, the rope which confines the bowsprit of a ship to the stern.

Bock Beer. See Beer.

Bocoya, a cask in Cuba, containing 36 wine gallons. As a package for coffee, sugar, etc., the *B.* varies. The coffee cask is either great or small, the *B. grande* containing 40 arrobas, and the *B. pequeno* 28 arrobas. The sugar cask holds from 50 to 54 arrobas, and the cask for molasses, 110 gallons.

Bodkin, a printer's tool for picking letters out of a column or page in correcting. — A sharp-pointed steel instrument for piercing holes, used by bookbinders and others.—A large-eyed blunt-pointed threading-needle used by tailors and others.

Bodle, a small coin; a Scotch penny.

Body, thickness; a printer's term for the size of the shank of type.

Body-Varnish, a thick and quick drying copal varnish used for carriages and other objects requiring to be polished.

Boiler, in general terms, any closed metallic vessel, kept partly filled with water, with arrangements for imparting heat to the water by means of the combustion of fuel, the steam generated being confined in the vessel above the water until it is required for use, when it is drawn off through pipes. This metallic vessel, with its compartments and openings, takes the name of "boiler" in the shops where it is manufactured. But in many classes or forms of *B.* the steam-generating apparatus is not complete until the *B.* is set up in

brickwork, with an external furnace constructed for the combustion of the fuel, and external flues made for conducting the heated gases to the chimney along the sides of the boiler. In others the *B.* is ready for use as it comes from the manufacturer, having within its external shell all these necessary arrangements for combustion and draught.

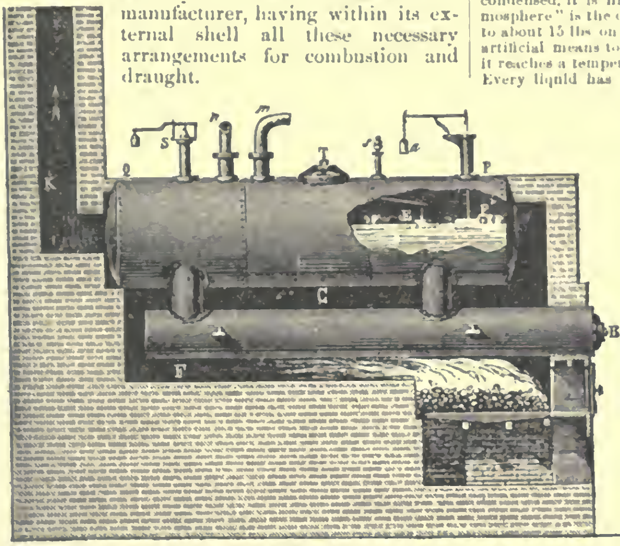


Fig. 37.—LONGITUDINAL.

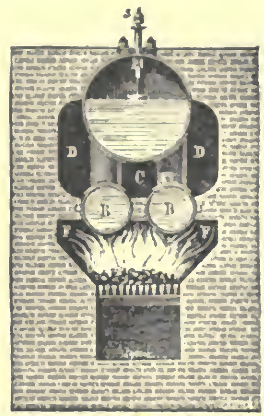


Fig. 38.—CROSS-SECTION.

Legend: **Fig. 37 is the Longitudinal, and Fig. 38 the Cross-Section, of a French Steam-Engine Boiler.**

BB, Generators, 2 in number; always full of water, and placed in the centre of the furnace to receive the full heat of the fire; *CDD*, jackets surrounding the generators and the lower parts of the boiler to retain the heat; *E*, float of alarm-whistle *s*; *FF*, furnace; *F'*, float to show the height of water in boiler; *K*, smoke-stack; *PQ*, cylindrical boiler connected with the generators by four tubes, and about half filled with water; *S*, safety-valve; *T*, man-hole; *m*, valve admitting steam to the engine; *n*, tube for the injection of water into the boiler; *s*, alarm-whistle which gives warning of water being too low in the boiler.

B. for steam-engines (Figs. 37 and 38) are made in many different forms—in cylindrical, globular, wagon-shaped, etc. They are mostly made of sheet-iron riveted, sometimes of copper, which is much dearer in the first instance, but more durable. Some are made with the fire inside, some at one end, while for rapid heating the surface is often exposed to a very large area of fire action. Locomotive *B.* have brass or copper tubes running from end to end, and well secured; the heated air is thus completely surrounded by water, which becomes thereby speedily raised to the boiling-point. Some *B.* have double internal flues, so adjusted that the heat in one shall assist the combustion of the fuel in the other furnace. The fierceness of the heat is kept up in some *B.* by a lofty chimney, in some by blast or blowing machines; while in the locomotive the waste steam is used to augment the draught up the short chimney or funnel. Most *B.* have several appendages belonging to them: a feed apparatus, to keep the *B.* supplied with water; a water-gauge, constructed in various ways, but always so as to show the height of the water in the *B.*; safety-valves, for admitting the air, and for giving the steam a self-acting power of escape when dangerously high; a man-hole to admit a workman to cleanse the interior, etc. The bursting of steam-*B.* depends on many circumstances besides bad workmanship and high pressure; it still remains a subject requiring very scientific investigation.

When a vessel containing water is heated, the temperature rises and vapor silently passes off from the surface; but at 212° F. (the barometric column standing at 30 inches at the sea-level) steam begins to be formed in bursts at the bottom, and rising through the liquid, throws it into commotion. If the steam is allowed freely to escape, the temperature of the water rises no higher. The water is then said to *boil*, and the temperature at which it remains is its *boiling-point*. On the top of a mountain, where the air is rare, the boiling-point is below 212°; at the earth surface, if the vessel is closed in, and a partial vacuum is formed, the boiling-point is similarly less than 212°. In a deep mine, or in a closed vessel with the air condensed, it is higher than 212°. What is called "one atmosphere" is the ordinary average pressure of the air, equal to about 15 lbs on the sq. in. If the pressure be increased by artificial means to two atmospheres, water does not boil till it reaches a temperature of 234°; four atmospheres, 284°, etc. Every liquid has its own special boiling-point. Salt water has a higher boiling-point than fresh water. Oil of turpentine and sulphuric acid are examples of liquids having a higher boiling-point than water, other circumstances being equal; while the boiling-points of ethers and alcohols are lower.

Boiler-Plates, flat sheets of iron used for making boilers, tanks, bridges, vessels, etc.

Boiling-Point, the temperature at which the elastic force of the vapor of any liquid is equal to the pressure of the atmosphere.

Bois, the French name for wood. *Bois à brûler* is fire-wood; *bois de construction*, building timber; *bois de teinture*, dye-wood.

Bois-Durci, or *hardened wood*, is the French commercial name of a material consisting of the sawdust of hard wood reduced to a fine powder, mixed with blood and other ingredients, and pressed into moulds, producing beautiful articles of various kinds.

Boisseau, the old French bushel or decalitre, which, by the new measures of France, is 12½ litres, equal to 763 English inches, or rather more than a third of an English bushel. The *B.*, however, varied in different localities, and also according to the grain measured.

Boissons, the general French term for drinkables, as wine, spirits, beer, etc.

Bokhara, or UZBECKISTAN, a state of Central Asia, in Turkestan, having N. and W. Khiva and Russian Turkestan, E. the Bolor-Tagh, and S. Afghanistan and Persian Khorassan. *Area*, 76,200 sq. m. The Hindoo-Koosh chain of mts. extends along the S. confines, but the greater part of the surface is level, consisting mostly of dry wastes and sandy steppes, save along the Amoo Jihoon and Kohik rivers, where the soil is fertile and agricultural. The inhab. manuf. silk stuffs, arms,

etc., but their pursuits are almost wholly pastoral. *Pop.* 2,500,000.

Bokhara, cap. of the above State, *pop.* 120,000, is one of the most important commercial emporia in Central Asia. From it come most of the genuine fine camel's-hair shawls sold in Europe and America, and which are hence called *Bokhara shawls*.

Bole, is a sort of greasy, earthy, lightly lustrous mineral, found in various traps and basaltic rocks. Several kinds are prepared into red and yellow pigments, useful in many of the manuf. arts. The *Imp.* duty of the Armenian *B.*, which is used as a tooth-powder, is 50 per cent.

Bolivia, a republic of S. America, bounded N. and E. by Brazil, S. by the Argentine Republic and Chili, and W. by Peru and the Pacific Ocean, lat. between 9° 30′ and 25° 40′ S., lon. 58° and 71° W. *Area*, 842,729 sq. m. *Pop.* 1,987,352, more than half being Indians and mixed races. The executive power is vested in a president, elected for 4 years; while the legislative authority rests with a congress of two chambers, elected by universal suffrage.

B. presents very different conditions of surface, elevation, and climate. It is traversed by the Andes, particularly towards the W., while on the E. it stretches into plains, which are watered by the Beni, Mamore, and other rivers which unite to form the Madeira, the largest affluent of the Amazon, and the Pilcomayo, one of the chief branches of the La Plata. This region is fertile, but it is nearly covered with vast primeval forests. In the plains, the climate is hot and unhealthy, except in the elevated valley of the Desaguadero, where it is temperate, especially from May to November. Earthquakes are common on the coast. The *mineral* productions are gold, principally found on the E. declivity of the E. cordillera of the Andes; silver from the mines of Potosi, which, however, are now much less productive than formerly. Copper is procured at Corocoro, and other places; there are also lead, tin, salt, brimstone, and nitre. Among vegetable products, the cocoa of Apollobamba and Moxas is celebrated; the sugar-cane and tropical fruits flourish in profusion on the banks of the Beni; and the E. of the Andes abounds in cascarilla, indigo, cotton, rice, coffee, tobacco, cinchona, copaiba, sarsaparilla, gum-elastic, vanilla, and other valuable drugs and dye-woods. The *manuf.* principally consist of cottons and glass made at Oropesa; woollens at La Paz; and hats at St. Francisco de Atacama. The *commerce* is inconsiderable, owing chiefly to the difficulties which have to be encountered in bringing the produce to market: the ports of the Pacific, which cannot be reached except by toilsome passage, being hardly available for the foreign trade. The country to Cobija, the only Bolivian port, is traversed by only one road, that from Oruro, and that is practicable only for mules and llamas. Cobija, though a free port, is therefore but little frequented; the Bolivians preferring to make their imports and exports in transit through the port of Arica in Peru, or by the recently opened route of the National Bolivian Navigation Co., up the Amazon River and its tributaries, through Brazil. The total imports of *B.*, in 1875, were about $5,500,000, chiefly from England. The exports, comprising silver, Peruvian bark, cocoa and coffee, and copper, tin, and other ores, were about $4,500,000. The U. States have almost no direct commercial intercourse with *B.*

Till within the last few years, the vast agricultural and mineral resources of the country were entirely dormant for want of means of communication; but more recently an attempt has been made to construct roads and railways. A line of railway connecting La Paz, cap. of the republic, with the port of Aygacha, on the Lake Titicaca, was opened for traffic in 1872, a second line from Autofagasta to Salar was completed in 1874, and several other lines are in course of construction.

Money. The *Peso*, or *Dollar*, of 100 *centomos*, is theoretically worth $0·96·5, but, for a number of years, the coins issued from the Government mint of Potosi have been 25 per cent., and more, below the standard.

Weights and Measures. The Libra = 1·014 lbs. avoirdupois; Quintal = 101·44 lbs.; Arroba of 25 lbs. = 25·36 lbs.; Arroba of wine or spirits = 6·70 gal.; Gallon = 0·74 gal.; Vara = 0·927 yard; Square Vara = 0·859 sq. yard.

Finances. The public debt, consisting of an internal and foreign debt, amounted in 1876 to $17,000,000. The foreign debt consists of a 6 per cent. loan of $7,500,000, nominal cap. — issued at the price of 68 — contracted in England in 1872. It was raised with the object of constructing a line of railway to enable the National Bolivian Navigation Co. to open communication between *B.* and the Atlantic Ocean. This object, however, was not carried out, and the greater part of the proceeds remained in England to furnish means for lawsuits extending over years.

Boll, in England and Scotland, a measure for corn, is the half sack, equal to 140 lbs., and divided into 10 stones or pecks. The *B.* of pease and beans weighs 280 lbs.; of oats, 264 lbs.; of barley, about 320 lbs.

Bollard, a large post to secure hawsers to.

Bologna Sausage, an excellent kind of dried sausage made of bacon, veal, and pork fat, and manuf. in Bologna, Italy. *Imp.* free.

Bolsa, in Spain, the exchange or place of business for money-changers and dealers.

Bolster, a long pillow or cushion stuffed with flocks, hair, or feathers, etc. — A tool for punching holes, and making bolts.

Bolt, a compact parcel or roll of canvas containing about 40 yards, 24 in. in width, and weighing about 28 lbs.; a bolt of silk is a long narrow roll. — A fastening, an iron or brass bar for securing a door.—The apparatus used for separating the bran from the flour.

Bolt-Boat, a strongly built boat, fitted to encounter rough and stormy seas.

Bolter, the machinery of a flour-mill, set in motion for separating the flour from the bran.

Bolting-Clothes, wire, hair, and other sieves of different degrees of fineness, used by millers for dressing or sifting flour and meal.

Bolt-Rope, a rope sewed to the edges of sails to strengthen them and prevent their splitting.

Bomb, a cast-iron projectile or combustible shell. See Shell.

Bombay. See India (British).

Bombay Shell, a name for the shell *Cassis rufa*, imported at Bombay from Zanzibar, and reshipped to England and France for cutting cameos.

Bombazet, a woollen material of various colors, woven, plain, or twilled.

Bombazine, a dress material for ladies, made of silk and worsted, the warp being of the former, the weft of the latter. It was formerly largely made at Norwich, England, but has now gone out of fashion.

Bon, the French name for a debenture, bill, or bond.

Bonanza, the Spanish name for a dividend.

Bonbonnière, a French sweetmeat-box.

Bonbons, [Fr.] sugar-plums; small confections.

Bond, is a description of obligation which assumes a variety of forms, and is connected with many of the contracts separately considered in this work. A simple bond is an executed deed in writing, and under seal, whereby the *obligor* (or person bound) obliges himself, his heirs, executors, and administrators, to pay a certain sum of money, generally with interest, to another (the *obligee*) at a certain time, or under certain circumstances. It is usual to grant *B.* to pay a certain sum, provided a certain act is not performed; or, more properly speaking, to grant an obligation which shall be void if a particular act be performed. It is thus customary to take a *B.* for double the sum intended to be paid, with the expressed condition that if the obligor pays a smaller sum (the actual sum due), the *B.* is void, the penalty in a *B.* — it is to say the double sum mentioned — being inserted merely to secure the full debt, with interest and costs. An obligation by *B.* extinguishes the debt of the principal contract debt, but the *B.* of a surety will not extinguish the debt of the principal. It cannot be assigned so as to enable the assignee to pursue on it in his own name; but the

assignee sues in the name of the obligee, a power to that effect being inserted in the assignment.

1. FORM OF COMMON BOND, WITH CONDITION.

Known all men by these presents: That I, A. B., of the town of ——, in the county of ——, and the State of ——, am held and firmly bound unto C. D., of, etc., in the sum of one thousand dollars, lawful money of the United States, to be paid to the said C. D., his executors, administrators, or assigns; for which payment, well and truly to be made, I bind myself, my heirs, executors, and administrators, firmly by these presents.

Sealed with my seal. Dated the —— day of ——, one thousand eight hundred and ——.

The condition of the above obligation is such, that if the above bounden A. B., his heirs, executors, or administrators, shall well and truly pay, or cause to be paid, unto the above named C. D., his executors, administrators, or assigns, the just and full sum of five hundred dollars, in five equal annual payments, from the date hereof, with annual interest, then the above obligation to be void; otherwise to remain in full force and virtue.

Sealed and delivered in presence of G. H. } A. B. [L. S.]

2. FORM OF BOND OF AN OFFICER OF A COMPANY OR BANK.

Known all men by these presents: That I, A. B., of, etc., am held and firmly bound unto the —— Company [or bank], in the sum of one thousand dollars, lawful money of the United States, to be paid to the said —— Company or assigns; for which payment, well and truly to be made, I bind myself, my heirs, executors, and administrators, firmly by these presents.

Sealed with my seal. Dated the —— day of ——, one thousand eight hundred and ——.

Whereas the above bounden A. B. has been chosen and appointed cashier [*or*, teller; *or*, treasurer, *as the case may be*,] of the —— Company [*or*, bank]; by reason whereof divers sums of money, goods and chattels, and other things, the property of the said company [*or*, bank], will come into his hands: Now, therefore, the condition of the above obligation is such, that if the said A. B., his executors, or administrators, at the expiration of his said office, upon request to him or them made, shall make or give unto the said company [*or*, bank], or their agent, or attorney, a just and true account of all such sum or sums of money, goods and chattels, and other things, as have come into his hands, charge, or possession, as cashier [*or*, teller; *or*, treasurer], as aforesaid, and shall and do pay and deliver over, to his successor in office, or any other person duly authorized to receive the same, all such balances, or sums of money, goods and chattels, and other things, which shall appear to be in his hands, and due by him to the said company [*or*, bank]; and if the said A. B. shall well and truly, honestly and faithfully, in all things, serve the said Company [*or* bank], in the capacity of cashier [*or*, teller; *or*, treasurer], as aforesaid, during his continuance in office, then the above obligation to be void: else to remain in full force and virtue.

Sealed, etc. [*as in Form 1.*].

Bonded Goods. See WAREHOUSE.

Bonded Storekeeper, an officer of customs detailed to take charge of a warehouse, or store, where goods liable to customs duty are permitted to be lodged in bond without payment of the duty until they are removed or cleared.

Bondsman, one who is bound or gives security for the faithful performance of any contract or money payments, due from another. See BAIL.

Bon du Tresor, a French Treasury bond, or government security bearing a varying rate of interest.

Bone-Ash, calcined bones reduced to a powder, and used for cleaning articles of jewelry, for sugar-refining, for making cupels, etc.

Bone-Black, a name for animal charcoal, the carbonaceous substance which remains after the calcination of bones in close vessels.

Bone-Dust, ground bones used for manure.

Bone-Earth, the phosphate of lime, or residue of bones which have been calcined.

Bones, the solid supports forming the skeleton or frame-work of the bodies of animals. *B.* enter largely into commerce for manuf. purposes. They are susceptible of being worked up into many useful forms by the mechanical processes of sawing, turning, stamping, drilling, etc., to make buttons, knife-handles, combs, tooth-brushes, etc. They are also employed for making gelatine, for the size used by dyers and finishers of fustians, velveteens, etc. When distilled in retorts, *B.* become decomposed, and their elements recomposed to form *sal ammonia*, *lamp-black*, *animal charcoal*, *plate-powder*, and one of the constituents for tipping *lucifer matches*. The largest use of *B.*, however, is perhaps now in making manure. *B.* are becoming an important item of U. States exports. In 1878, 47,429 cwts. of *B.* and *B.* dust, valued $78,989, and 2,738,784 lbs. of bone-black, ivory-black, and lamp-black, valued $80,740, were exported, chiefly to England and Germany. *Imp.* duty: (not manuf.) free; (manuf.) 35 per cent.

Bone-Waste, the dust or refuse of bones, after the gelatine has been extracted by the bone-boilers, extensively used for manure in Europe.

Bonification, [Fr.] is an allowance made in form of a discount.

Bonito, the name of a fish, the *Thynnus pelamis*, the sun-dried flesh of which is a staple commodity in the Maldives. When properly cured, it is as hard as horn, and is cut for export into pieces of a few ounces' weight.

Bonnet, a lady's covering for the head, made of different materials, according to season and fashion.

Bonnet-Box, a kind of paper or thin wooden band-box.

Bonnet-Frames, are foundations for ladies' bonnets, shaped and ready to be covered and trimmed.

Book, a name applicable in a general sense to almost every literary composition, but usually confined to such compositions as are large enough to form a volume. Printed volumes are distinguished according to the number of leaves produced from one sheet of paper. *Folio* is the largest size, of which 2 leaves or 4 pages make a sheet; *Quarto*, or 4to, 4 leaves or 8 pages; *Octavo*, or 8vo, 8 leaves or 16 pages; *Duodecimo*, or 12mo, 12 leaves or 24 pages; *Octodecimo*, or 18mo, 18 leaves or 36 pages, and so on. These again differ according to the size and form of the sheet. Thus there are royal, demy, post, and crown octavos; and the same with the others.

The modern book trade dates from the discovery of the art of printing with movable types by John Gutenberg, of Mayence, in 1441. In 1471, the art was brought to London by William Caxton, a mercer, and from that time until 1600 the activity of the press was considerable; the works chiefly used being Bibles and works on divinity, translations of the classics, versions of French and Italian romances, and old chronicles. Few, however, but "clerks and noble gentlemen," could then use these works, as their expense and the imperfect state of education placed them beyond the reach of the people in general. In 1516, "Fitzherbert's Abridgment," a folio law-book, was sold for 40 shillings, a sum which at that time would have bought 3 oxen. The edition of a book at that time averaged about 200 copies. The stormy period from 1600 to the revolution in 1688 was, although the age of Shakespeare, Bacon, and Milton, upon the whole less favorable to the diffusion of knowledge; and the number of books issued, unconnected with religious or political controversy, was very small. The period from 1688 to the accession of George III. in 1760, was much more remarkable. Newspapers were established on a regular footing, both in London and the provinces:

in 1731 appeared the "Gentleman's Magazine," the first of that class of periodicals produced in England; and in 1749, the first review, "The Monthly," and other similar works soon followed. Publishers attained higher influence in society, and the trade of books went much more than formerly into regular commercial channels. The number of new ones printed during this period was, however, not large, as the publishers appear to have aimed less at novelty than at selling large impressions of a few standard works. Between 1700 and 1756, excluding pamphlets and tracts, only 5,280 new books appeared; or, on an average, 93 annually. The period from 1760 to 1800 is distinguished less for originality than for the increased diffusion of literature. Periodical works were multiplied, and the principle of "number books" was then first developed. Of the latter, one of the most successful was Smollett's "History of England," which sold to the extent of 20,000 copies. Towards the end of the century, the average number of new books published annually was about 370, exclusive of pamphlets. From 1800 to 1827, the average annual number of new books, exclusive of pamphlets, was about 588, showing a very considerable increase relatively to the preceding period. Notwithstanding this increase, little had been done for many years in economizing the mode of conveying knowledge, and the reading portion of the middle classes had little or no opportunity of gratifying their taste, except through the medium of circulating libraries and reading clubs. A large class of readers, however, had now arisen, for whom a new species of literature was to be provided. With the view of meeting the wants of this class, a number of enterprising publishers directed their attention to the issue of cheap editions of the great writers. The success which generally attended these operations gradually revolutionized the book-trade. The portly folios and quartos of former times gave place to octavos and duodecimos; and publishers found it their interest in bringing out works, even for the wealthiest, to place them at the same time within reach of the generality of the middle class, reimbursing themselves for the lower price charged by the large impression sold. This change has been gradually effected without producing, as many anticipated, any diminution of new works. On the contrary, there has been a considerable and constant increase; and the truth of the observation, "that the more people read, the more they will read," has been confirmed. The principal localities of the English book-trade are London, Edinburgh, Dublin, Glasgow, Oxford, and Cambridge. Of these, by far the most extensive is London, which may be regarded as the emporium of the whole kingdom, as the provincial publishers have all agents there, to whom a large proportion of their works are consigned as soon as printed.

English Law. Books first composed, or written, or printed in the United Kingdom, and printed or reprinted in any other country, are prohibited from being imported for sale, except books not reprinted in the United Kingdom within 20 years, or being parts of collections, the greater parts of which had been composed or written abroad. — Books first composed, or written, or printed and published in the United Kingdom, and reprinted in any other country or place, may not be entered to be warehoused. — The importation for private use of English books reprinted abroad is limited to a single copy for each party, accompanied by luggage.

In the U. States, the development of the book-trade has been for the most part within half a century. The oldest house in the trade is that of Sower, Potts & Co., whose founder, Christopher Saur, Sr., made almanacs and German Bibles near Philadelphia, in 1740. In 1820 it was estimated (by S. G. Goodrich) that the book production of the U. States amounted to only $2,500,000, of which not more than 30 per cent. were original American books; for 1830, $3,000,000, 40 per cent. American; for 1840, $5,500,000, or 12,000,000 volumes, 55 per cent. American; for 1850, $12,500,000, 70 per cent. American; for 1856, $16,000,000, 80 per cent. American. The book production of 1871 has been estimated at $40,000,000. In 1878, 5,632 books were copyrighted, which is an increase of 1,156 on 1877. In the absence of internal taxation or other authoritative statistics, these estimates are of little value; but it is certain that the proportion of books of American origin has steadily increased. The American book-trade is divided into three classes, — publishers, jobbers, and retailers. The book-trade proper numbers probably not more than 3,000 stores, but there are, perhaps, 10,000 which sell books and periodicals in connection with other lines of trade. Of these, about 800 are publishers, to the extent of an occasional book, though nine-tenths of the trade is done by less than 50 publishers. Besides the publishers selling through the regular trade, there is a large class of *subscription publishers* who sell their books exclusively through agents, to whom a particular district is assigned. The educational publishers are a class by themselves, although most of the largest general houses have extensive educational departments in addition to their regular business. Other specialties, as medical and law publishing, are also chiefly carried on by special houses. The jobber is the middleman, who orders large supplies, often by the thousand copies, from the publishers, and distributes them among the retailers throughout the country. He differs from the European commissioner in buying the stock and making what profit he can, instead of filling orders on commission.

Many houses are at once publishers, jobbers, and general retailers; others publish and keep a retail store; many are jobbers and retailers together; while some confine themselves to publishing and selling their own books A peculiar feature of the American book-trade is the *trade sale*, an auction held in New York each spring and fall, to which the publishers send quantities of their new publications, and of their standard books. These are sold to the highest bidder among the members of the jobbing and retail trade who come together at these times.

The common forms for American books are the 12mo for novels, books of poetry, etc.; the octavo for books of travel, treatises, etc.; and royal octavo for books of reference. A form called the *Little Classic*, a square 24mo, has lately become a favorite; and a still smaller class of books, under the title of *Vest Pocket* size, is a yet newer fashion. Tinted paper is frequently employed in preference to white. The paper, stereotype, and press-work of American books are generally above the average of similar publications in any country of Europe.

In 1878, the imports of books, pamphlets, engravings, and other publications (chiefly from England, Germany, and France) were $1,870,580, against $2.897,125 in 1873, which is a decrease of $1,026,545. The exports of the same, to almost every civilized country, amounted in 1878 to $586,355. — *Imp. duty.* Books printed more than 20 years before, or imported for the use of public institutions, or of schools, or the property, within certain limits, of persons arriving in the U. States, are admitted free of duty. Other books and periodicals are taxed 25 per cent.

Postage. Books are carried by post at 1 cent for 2 ozs.— See COPYRIGHT, PRINTING, etc.

Bookbinders' Cloth, colored cottons, enamelled or embossed, made in imitation of leather or morocco, and used instead of leather in binding books. It is imported from England. *Imp.* duty, 35 per cent.

Bookbinding. This useful and elegant art comprises a number of ingenious applications of leather, cloth, paper, and gold.—*Folding.* Supposing a book to be bound in leather in medium size, the first process is to fold the sheets of paper into pages, according to size of the book. There are certain marks put in by the printer, called *signatures*, to guide the folder. The folding is made on a flat table, by women, with the aid of a long paper-knife; practice enables them to do it with great exactness, and with a rapidity of 300 to 500 octavo sheets in an hour.—*Rolling.* The sheets require to be rolled or pressed to make them smooth and compact. This compression used to

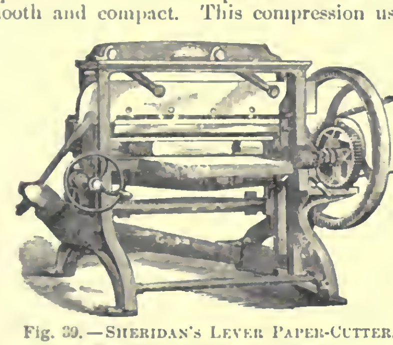


Fig. 39.—SHERIDAN'S LEVER PAPER-CUTTER, *With Hand or Automatic Clamp.*

be done by beating them in small clusters at a time with a hammer of 12 lbs. or 14 lbs. weight; but it is now better effected by a *rolling-press.* This consists of two smooth horizontal iron rollers, placed a small distance apart. The process is completed in a shorter time, it compresses the sheets into a more compact mass, and makes them smoother than by hammering. Sometimes, however, the sheets are placed in an hydraulic press. —*Sewing.* The sheets forming one volume, brought together in a mass, are fixed in a *cutting-press*, and saw-cuts made across the back edge to receive the bands or cords to which the sheets are to be sewed, and which aid in fastening the covers. The sewing-press was then coming in use, but it has been recently superseded by an ingenious little machine of American invention, by which a bit of wire is driven through the sheets and clinched at one blow on the other side.—*Rounding.* The back edge of the book receives a coating of glue and canvas. Then, by a dexterous application of a hammer and the fingers, the back edge, while still moist with glue, is made round or convex, and the front edge hollow or concave; while a kind of groove or recess is made to receive the covers, one on each side.—*Edge-cutting.* The edges are then cut smooth by a cutting-tool called a *plough*, which bears some resemblance to a carpenter's plane. The squeezing of a press keeps the book together in a compact mass while this is being done. The concave edge is temporarily made flat during this cutting, but it springs back to its proper concavity afterwards.—*Binding.* The covers of books are mostly made of millboard, cut to the proper sizes and shapes from large sheets. Holes are made through them, corresponding to the cords or strings; and the fastening of the covers to the book mostly depends on the cords, which are passed through the millboard and pasted.—*Covering.* The covering with leather next ensues. This is made by pasting the leather to the covers; but much delicate manipulation is needed to effect this neatly. The "hollow back" of a book is produced by the interposition of paper or cloth between the edge and the leather, in a way that enables the book to be opened without crinkling the back.—*Tooling and lettering.* Much of the adornment of a bound book is produced by tooling. Numerous tools are employed in a heated state, to be pressed heavily against the leather of the covers. If no gold is used, the tool produces a dark shining device, which is called *blind tooling;* but in *gold tooling* leaf-gold is applied before the tools are used. In this latter case the gold is fixed to the leather by a coating of gold size, and the surplus gold is easily wiped off after the tooling. In *blocking*, the tools are fixed into a frame to form a device for the whole cover of a book; and this is brought to bear by the force of a press; it receives the name of *gold blocking* or *blind blocking*, according as gold is or is not used. The lettering of a bound book is but one special example of gold tooling, the tool being supplied with types instead of with an ornamental device.—*Edge Gilding.* Edges of books are sometimes *sprinkled* with color; sometimes marbled with a peculiar kind of parti-colored device; sometimes coated with one particular color, highly glazed, like the red-edged Bibles and Prayer-books now much in fashion. The more elegant kinds are gilt. To do this, the top, bottom, and front edges are scraped smooth with a piece of steel; they are coated with a composition of red chalk and water; this is wet with white of egg and water; the leaf-gold is laid on; and soon afterwards it is brilliantly polished by rubbing with a burnisher of agate or blood-stone. Other kinds of bookbinding require modifications in many of these processes. A book in *cloth boards* does not receive so much pressing as one bound in leather. A boarded book usually has only two or three strips to which the sheets are sewed; a bound book has more; and sometimes there are strips of vellum or parchment instead of strings. In *India-rubber binding* there is usually no sewing, the back edges of the leaves being cemented together with liquid caoutchouc. Books in boards have seldom got the edges so completely cut as bound books. The cloth cover is attached to the boards to form a *case* before the latter is applied to a boarded book. Much of the cloth is woven and embossed expressly for bookbinders' use. The case is attached to the book mainly by pasting, and not by the aid of the strings or cords. The sprinkling of *roan* or *sheep-bound* school books is done in nearly the same way as that of the edges of leaves. In cloth binding, the cloth for each particular book is often passed between cylinders specially engraved with some particular device; in other cases, a heavy stamping-press imprints a particular device on the cover after the cloth has been pasted on the millboard. *Vellum* binding, for account-books, bears special relation to the substantial way in which the sheets are stitched to vellum bands, and the bands fastened to the covers or boards.

Book-Case, an article of furniture for a library or sitting-room, generally glazed to preserve the books from dust.

Book-Debt, a charge for goods supplied, or work and labor done, entered in the ledger of a trader, or professional man.

Booked, duly charged; entered in a book.

Book-Keeper, an accountant, or one who has charge of the books in a bank or business establishment.

Book-Keeping, is the art of registering mercantile transactions for reference, statement, and balance; all of which must be so clearly done that the true state of every part, and of the whole, may be easily and distinctly known. The only method of book-keeping founded upon general principles is the *Italian*, or, as it is generally called, the *double-entry system*, from its being based on the principle that every transaction in business is virtually a transfer between two accounts, and so must be entered to the debit of the one and the credit of the other. In the present article it is proposed to give — I. An outline of the ordinary procedure in recording the transactions of a general merchant; — II. Practical directions for stating the different accounts; — and, III. A short account of a *single-entry system* adapted for retail business; premising the following general rules:

Record nothing but facts.

Record facts under their date of occurrence.

Record them under their proper heads of account.

Facts of the same character are to be represented by addition; facts of different characters by opposition; but the result of two different species of facts is never to be represented by their difference.

I. *Outline of the ordinary procedure in recording the transactions of a general merchant.*

The double-entry system, according to the practice of most commercial establishments, comprehends three different kinds or classes of books: — 1st, *Primary Records*, or Day-books, for each distinct branch of business — as Cash, Bills, Invoices Inward, Invoices Outward, Sales on Commission, and so on, according to the nature of the trade, and in each of which the transactions are stated circumstantially as they occur. 2d, The *Journal*, in which all the entries in the primary records are collected and digested monthly in a concise technical form, suited for their being readily transferred into the ledger. 3d, The *Ledger*, in which the results shown in the journal are arranged under their appropriate heads; and the periodical abstract of which, termed a *Balance Sheet*, exhibits in a succinct form the state of the merchant's affairs.

PRIMARY RECORDS.

Cash Book. This, though the most important of all, is in its form the most simple. On the left-hand page, or Dr. side, are entered in chronological order all the sums received; and on the right-hand, or Cr. side, in the same order, all the payments. As no money can be paid that has not been first received, it follows that the Dr. side of a cash-book can never amount to less than the Cr. side; the excess of the former above the latter, if any, must, when correctly kept, also correspond with the money in hand.

Bill Books. Bills are either *receivable* or *payable;* the former being one of the channels through which debts due to the concern are collected, the latter one of the channels through which debts due by the concern are discharged. Each description has generally a book allotted to itself, both of which should contain spaces for all particulars inherent and relative to the bill.

The *Bills Receivable* book should contain appropriate spaces for the following particulars: No. — When received — On whose account — Cr. folio — From whom received — Drawer — Drawee — To order of — Where payable — Date — Term — When due — Sum — When and to whom paid away — Dr. folio.

The *Bills Payable* book should contain spaces under the following heads: No. — When accepted — On whose account — Dr. folio — Holder — Drawer — To order of — Where payable — Date of Bill — Term — When due — Sum — When and to whom paid — Cr. folio.

Both books, it will be observed, are furnished with columns for running numbers; which numbers are also written on the face of each bill respectively, and by this means it can be readily referred to and identified.

Invoice Book Inwards, or *Bought Book*, is a receptacle for bills of parcels, or accounts of goods purchased.— In some houses these accounts are copied at length in the order in which they are received; while others form this book of blue, or common blank paper, into which the original accounts are pasted.

Invoice Book Outwards is appropriated for an account of goods sold on credit at home, or exported abroad. This book being of great importance, should be kept with the utmost precision, and carefully verified before the sums are transferred to the journal and ledger. In extensive concerns, several books of this kind may be kept at the same time, the titles of which can be varied according to the nature of the business. Thus one may be appropriated for *Town department*, another for *Country department*, and a third for *Foreign department.*

Sales Book, or *Factory Book*, is generally appropriated to accounts of consignments. Each account commonly occupies two pages, a title being placed over both, stating the names of the goods, ship, and consignor. The left-hand page contains an account of the charges incurred, including brokerage and commission; the right-hand page contains an account of the quantity, price, and amount of the goods sold, with the buyer's name, and the time of payment. The difference between this amount, and the charges on the other side, is the net proceeds for which the consignor receives credit.

Other books may be kept according to the nature of the business; as a Debentures Book, Insurance Book, etc.; and the common practice, as already noticed, is to set apart books for each distinct department of business. In some houses, however, a Waste Book, or Petty Journal, is appropriated for such occasional transactions as do not fall under any of the preceding heads.

These exhaust the authorities from which it is usual to compile the journal. There are, however, a variety of other books, kept in every counting-house, which do not commonly form part of the materials for the journal, such as the Warehouse Book, Letter Book, Account-Current Book, Account-Sales Book, Petty Cash Book, and Order Book. The Warehouse Book, kept in a similar way to the Sales Book, contains accounts for each

parcel of goods belonging to the merchant's own stock, detailing the quantities received, their disposal, the charges incurred, and the quantities on hand. The use of the others is sufficiently pointed out by their names.

JOURNAL.

The journal, as already stated, is a monthly synopsis of all the transactions collected from the primary records, and digested under their appropriate heads of Debtor and Creditor. It usually contains, 1st, A column for the day of the month; 2d, A column for the folio of the ledger where each account is posted; 3d, A space for narrative; and, 4th, Two money columns. The rules for distinguishing Dr. and Cr. are to be inferred from the nature of the transactions and the accounts in the ledger. In personal accounts nothing is plainer than who are Dr. and Cr.; in actual business this is not only understood but felt. The following are the most general rules that can be given:

Whatever is *Received*, or the *Receiver* is *Debtor*.

Whatever is *Delivered*, or the *Deliverer* is *Creditor*.

The journal begins with the inventory of stock. Thus, if the property or assets of the merchant consist of Cash, $1,000; Bill No. 57, on P. Hill, due April 3, $600; Merchandise, $4,500; Debt due by Peter Gray, $800; and his obligations or liabilities, Bill No. 80, to P. Yates, due Jan. 6, $1,700; Debt due to Moses Ker, $1,150, the journal entries will be in this form:

SUNDRIES DR. TO STOCK.

Cash	$1,000
Bills receivable, No. 57, P. Hill, due April 3	600
Merchandise	4,500
Peter Gray	800
	$6,900

STOCK DR. TO SUNDRIES.

To *Bills payable*, No. 80, P. Yates, due Jan. 6	$1,700
To *Moses Ker*	1,150
	$2,850

The primary records are journalized at the end of each month.

In journalizing the CASH BOOK, state

Cash Dr. to *Sundries*.......For all money received.
Sundries Dr. to *Cash*.........For all money paid.

Specifying particulars, and classing items of the same kind together.

In journalizing the BILL BOOKS,

Bills Receivable Dr. to *Sundries*...For all bills received.
Sundries Dr. to *Bills Payable*.......For all bills accepted.

In journalizing the INVOICE BOOK INWARDS,

Goods Account Dr. to A. B. (the seller)...For amount of goods purchased.

In journalizing the INVOICE BOOK OUTWARDS,

C. D. (the person on whose account the invoice is sent) Dr. to *Sundries*. To *Goods*...For amount of goods.
To *Charges*..........For Shipping and other charges.
To Commission ...For the Agent's commission.
To Insurance......For Premium of Insurance.

The case here supposed is that of a consignment to order. When the transaction is a direct sale, or Venture Outward, no commission is charged.

In journalizing the SALES BOOK,

Sundries Dr. to *Sales on Commission*.

E. F. (the Purchaser)......For sales on credit.
Cash............................For ready money sales.

Sales on Commission Dr. to *Sundries*.

To *Charges*......For charges at landing, etc.
To *Interest*......For interest (if charged on advances).
To *Commission*.For the Agent's commission.
To G. H. (the Consigner)...For net proceeds.

The journal for the month is then closed by a similar arrangement of the transactions contained in any other Record which the nature of the business may render necessary.

LEDGER.

This book is divided into distinct accounts, corresponding to the different branches of the business, into which are *posted* monthly the results brought out in the journal. Each account is introduced by an appropriate title; and articles of opposite kinds which belong to the same account are placed on opposite pages. The left-hand page is called the *Debtor*, or *Dr.*, side of the account; and the right-hand page the *Creditor*, or *Cr.*, side. The difference between the sums of the Dr. and Cr. sides is called the *Balance*.

The accounts in the ledger may be divided into two great branches. The first forms the accounts of the whole property or capital, technically called *Stock*, and the second embraces the accounts of the component parts of property. Under the general head of *Stock Accounts* are comprehended *Profit and Loss* account, and its ramifications, *Commission*, *Interest*, and *Charges;* the object of these accounts being to collect together the individual augmentations and diminutions of capital, and to transfer the results in one general entry to *Stock;* and also *Private Account*, its use being to record all sums put into the business, or withdrawn, so as to keep them distinct from *Profit and Loss*, and to transfer the result in the same manner in one entry to *Stock*. The accounts of the component parts of property will depend upon the nature of the business; but in general point of view, the whole may be conveniently arranged as follows:

1. WHOLE PROPERTY.

	Branches.	*Ramifications.*
Stock.....	Profit and loss.	Commission.
		Interest.
	Private account.	Charges.

2. COMPONENT PARTS OF PROPERTY.

Accounts of Money, Real Property, etc., viz., Cash, Bills Payable, Bills Receivable, Goods, Houses, Stocks, etc.

Personal Accounts, viz., Bank, Ordinary Debtors and Creditors.

As by the fundamental law of double entry every debit must have a corresponding and equivalent credit, and *vice versa*, it follows that the two sides of the ledger must, if correctly posted, be constantly in a state of equilibrium; it follows likewise, from the axiom that "the whole is equal to the sum of all its parts," that the balance of the stock account must equal the aggregate balance of all the other accounts. Hence arises the proof of double entry, which consists in abstracting the balances of all the accounts in the ledger, and verifying their accuracy by ascertaining how far the above requisites have been fulfilled. This operation, called *balancing the books*, is usually performed

at the close of the year; at which period, likewise, the gain or loss during the year is indicated by the credit or debit balance brought into "Stock Account" from "Profit and Loss," after transferring to the latter its branches, Commission, Interest, etc., and the differences between the debit and credit sides of the goods and property accounts, after crediting the balances of merchandise and property on hand at their market value. The whole debit and credit balances being then arranged in opposition to each other, will give a condensed view of the merchant's assets and liabilities, and of his capital stock in the following form:

BALANCE ACCOUNT.

Cash	$1,946	Bills Payable........	$4,500
Bills Receivable in hand..	1,463	Debts Payable........	7.500
Goods, do....................	6,500		$12,000
Real estate....................	4,800	*Stock*, or net capital.	10,000
Stocks........................	1,400		
Debts Receivable...........	5,891		
	$22,000		$22,000

II. *Practical Directions for stating the different accounts, including Observations upon Joint Accounts.*

STOCK. — This is in truth the account of the merchant himself, or the concern; and in commencing a new set of books, is debited with all the liabilities, and credited with all the assets. Thus the sums given above under the head *journal* will be entered in the ledger in this form:

Dr.	*Stock.*	*Cr.*
To Sundries........$2,850		By Sundries......$6,900

— the excess of the credit above the debit side, $4,050, being the net capital or stock in trade. If at next balance it shall be found that a profit of $4,000 has been realized, while $2,000 has been withdrawn for private expenses, *Stock* will fall to be credited "By 'Profit and Loss,' $4,000," and debited "To 'A B's Private account,' $2,000." After which the balance at Cr. of "Stock," or A B's net capital, will be $6,050.

PROFIT AND LOSS. — During the course of the year, this account should be debited solely for actual losses, and credited by actual gains; leaving the balances of Commission, Interest, Charges Account, etc., to be transferred at the time fixed for balancing. Some houses amalgamate the whole of these accounts into one general Profit and Loss account; but this is objectionable, especially in large concerns, where it is of importance to preserve all the channels of gain and loss as distinct as possible. A better plan is to open a separate account for Profit, and another for Loss.

The balance arising on Profit and Loss account is transferred "To Stock," or "By Stock," according as the result is gain or loss.

COMMISSION ACCOUNT is credited for all commissions received for our trouble in transacting business for others. There are seldom any entries to the debit, as the charges for commission made by our agents properly belong to the Goods Account to which they have reference. It is closed by transferring the balance to "Profit and Loss."

INTEREST ACCOUNT contains on the Dr. side all sums paid or incurred for interest or discount; and on the Cr. all sums received or become due for the same. The difference, at balancing, is transferred to "Profit and Loss."

CHARGES ACCOUNT contains on the Dr. side all general expenses paid or incurred in the business, as rents, taxes, salaries, postages, and incidentals. If any of these should be afterwards charged to some other account, the sums so charged are entered to the Cr. The balance is transferred to "Profit and Loss."

In some houses, separate accounts are kept for Export Charges, Charges on Sales, on Commission, etc., such accounts being dissected periodically, and credited by the different parties, or Adventures, for which the charges were incurred.

PRIVATE ACCOUNT contains on the Dr., money, or anything else withdrawn from the concern for private use. It seldom contains anything on the Cr. side. The balance is transferred to "Stock."

CASH. — Some houses post the ledger directly from the Cash Book, without any intermediate entry in the Journal beyond "Cash Dr. to Sundries" for the monthly amount of receipts; and "Sundries Dr. to Cash" for the monthly amount of payments; but the more general method in large concerns is that described above under the head "Journal." By both plans, the cash account in the Ledger is usually comprised in twelve lines on each side yearly.

The mode of stating the cash details is simple. When goods are sold for ready money, Dr. "Cash," Cr. "Goods," or account to which the goods belong. When cash is received for goods formerly sold on credit, Dr. "Cash," Cr. the purchaser. When goods are bought for ready money, Cr. "Cash," Dr. "Goods," or account to which the goods belong. When cash is paid for goods purchased on credit, Cr. "Cash," Dr. the seller. When money is received of one person for the use of another, or for his own use, Dr. "Cash," Cr. the person for whose use it is received. When money is paid to one person for the use of another, or for his own use, Dr. the person for whose use it is paid, Cr. "Cash." When money is lent, Cr. "Cash," Dr. the borrower. When money is borrowed, Dr. "Cash," Cr. the lender. When a note is paid, Cr. "Cash," Dr. "Bills Payable." When a bill is discounted, Dr. "Cash," and Cr. "Bills Receivable" for the total amount of the bill; and Cr. "Cash," and Dr. "Interest," for the discount.

BILLS PAYABLE ACCOUNT is credited with all bills accepted, and debited with those paid; the balance shows the amount of bills unpaid.

BILLS RECEIVABLE. — This account is debited with all bills received, and credited with those paid, discounted, or otherwise disposed of; the balance shows the bills remaining in hand.

In the *Renewal of Bills*, — 1st, If the bill be in your own hands, make A B (the acceptor) Dr. to Sundries; viz. To "Bills Receivable," for the sum of the old bill; To "Interest," for interest for the time the bill is renewed added to the new bill; and then "Bills Receivable" Dr. to A B for the new bill. 2d, If the bill be discounted, or paid away, make A B Dr. to "Cash" when you pay his bill, and A B Dr. to "Interest" for interest; then "Bills Receivable" Dr. to A B for the new bill. If the new bill, however, be drawn for the same sum as the former, and the interest paid in cash, it is sufficient to enter "Cash" Dr. to "Interest" for the interest, without bringing it to A B's account.

In the *Protesting of Bills*, — 1st, If the bill be in your own hands, make A B (on whose account it was received) Dr. to "Bills Receivable" for the bill, and A B Dr. to "Cash" or "Charges," for expenses of protest; 2d, If the bill be discounted or paid away, A B Dr. to "Cash," paid his bill with expenses.

Accommodation Bills. — When you receive another person's acceptance, or grant your own note and receive the proceeds, in either case merely for your own accommodation, enter "Bills Receivable" Dr. to "Bills Payable" for the bill (as you will have to provide for it when it falls due); and when discounted, "Cash" Dr. to "Bills Receivable," and when paid, "Bills Payable" Dr. to "Cash." When you grant your bill to another, merely for his accommodation, it is sufficient to note the particulars in a "Memorandum Book," or "Register Bill Book," and take an obligation from him that he is to provide for it when it becomes due. If he then be unable to pay the bill, enter A B Dr. to "Cash." Where, however, accommodation bill transactions between two parties are numerous, the best way is to open a separate account for them.

Merchants whose bill transactions are numerous, keep a *Register Bill Book*, in which all bills they receive, or become bound to pay, are entered in the order in which they fall due, to enable them to regulate their payments without embarrassment.

GOODS ACCOUNT commences on the Dr. side, with the balance of goods on hand. Goods bought are entered on the same side; and goods sold on the Cr. Charges laid out on goods are entered on the Dr. side, as also discounts allowed on goods sold; and on the Cr. side discounts received on goods purchased, as well as any other incidental advantage which arises from them. On closing the account, Cr. By "Balance" for value of goods on hand. If the Cr. side is then found to exceed the Dr. the account is to be debited, To "Profit and Loss" for gain; and, if the contrary, it is to be credited By "Profit and Loss" for loss. In some houses, separate accounts are opened in the ledger for each kind of goods; but perhaps the more general practice is to open only one general account, and leave the gain or loss upon the different parcels to be ascertained from the Warehouse Book.

ACCOUNTS OF SHIPS, REAL ESTATE, etc., are debited with the cost and outlays, and credited with the freights, rents, and other receipts. The difference is transferred to "Profit and Loss," after crediting them "By Balance" for their value at the time of closing.

PERSONAL ACCOUNTS are debited to Goods, Cash, Charges for Commission, and for everything we give out; and credited for what we receive either in Goods, Cash, or Charges, etc. Where the transactions with a party are numerous, and of different kinds, several accounts may be opened; thus with A B you may open his "General Account," his "Accepting Account," his "Account of Consignments," etc., the balance of all, or any of these, being transferred at certain periods to his "Account Current."

INSURANCE ACCOUNT is stated in various ways, according to circumstances. In the books of a merchant, or person insured, it is debited to the Broker or Insurance Company, for the amount of premium and policy, and credited by the Adventure or person for whose account it is effected; the Broker being debited for Returns, Averages, or Losses, to the accounts that were formerly charged with the premiums. Where, however, the merchant acts as his own broker, it will be convenient to open a separate set of Insurance books for the accounts of the different underwriters, etc., and to reserve his general ledger for an Insurance Account, and an account for himself as "Broker," both of which will be stated, as in the former case.

In the books of an Underwriter, "Insurance Account" is credited by the broker or party insured for the premium, etc.; and debited to the same accounts for Returns, Averages, or Losses; the difference being transferred at balancing to "Profit and Loss." On balancing, care must be taken to transfer the premiums on current risks to a "Suspense" or "Guarantee Account."

DEBENTURE ACCOUNT is debited to "Goods" for the drawbacks to be received on goods exported from our own stock, and credited by "Cash" when we receive the same; the balance shows the debentures outstanding.

GOODS RECEIVED ON COMMISSION. — Separate accounts are sometimes opened in the ledger for each consignment; but as this is done in the Sales or Factory Book, it is usual to confine the ledger accounts to two general ones, namely, "Sales on Commission," and "Charges on Sales on Commission." The first is credited by the accounts of the different purchasers for the gross sales; and debited (after each consignment is sold) to "Charges on Sales on Commission" for the amount of charges, to "Commission" for your commission, and to the consigner for the net proceeds; and the balance will consist of the gross proceeds of goods not yet accounted for by you. "Charges on Goods on Commission" is debited to "Cash," etc., for all charges, and credited as already stated: the balance will show the amount of advances remaining to be accounted for to you.

ADVENTURES. — In *Adventures Outward*, two accounts are generally opened with the foreign agent, "A B Account of Consignments" is debited with the cost of the goods, Insurance, and Charges; and credited by "A B Account-Current" for net proceeds; the difference being carried to Profit and Loss. The account-current is credited by remittances. In *Adventures Homeward*, the foreign agent's account is credited by "Goods," or as the case may be, for the amount of invoice and charges; and debited with remittances.

Consignments by you to parties in this country are stated in the same manner as in Adventures Outward.

Joint Adventures may be stated in various ways. If A and B ship goods conjointly to Liverpool, to the value of $1,500, of which $1,050 are from A and $450 from B, and the net proceeds realized by Z be $2,000, the accounts may be stated in this form in A's books, supposing him to be manager, and the profits divisible equally.

DR. Adventure to Liverpool on Joint Acct. with B. CR.

To Goods	$1,050	By B, his one-half cost..	$805
To B	450	By Z, my one-half net proceeds	1,000
To Insurance	60		
To Charges	50		
	$1,610		
To Profit and Loss	195		
	$1,805		$1,805

DR. B. CR.

To Adven., his one-half cost	$805	By Adven., etc.	450
To Balance	645	By Z, his one-half net proceeds	1,000
	$1,450		$1,450

DR. Z. CR.

To Adven., etc.	$1,000	By Balance	$2,000
To B	1,000		
	$2,000		$2,000

The balance of $645 is paid to B, on the $2,000 being remitted by Z. The adventure may also be stated by A as though it were his own entirely, giving credit to B for his goods, and half the profit.

BRANCHES.—Concerns which have branch establishments should open accounts with each precisely as if they were strangers.

BAD DEBT ACCOUNT is debited to "A B," for bad debts incurred, and credited by "Cash" for dividends, etc., and by "Profit and Loss" for the net loss sustained at the period when the debtor is discharged, or the recovery of his debt has become hopeless.

A preferable mode of disposing of bad debts is to open a *Guarantee Account*, and credit it at the period of balancing by "Profit and Loss" for the probable amount of loss by bad or doubtful debts. In this case, the debtor's own accounts are debited for dividends, etc., and afterwards by "Guarantee Account" for net loss. At each succeeding period of balance a new valuation of bad debts is to be made, and an additional sum credited to "Profit and Loss," if found requisite.

Partnership Accounts may be kept in the general ledger in six different ways, namely, three in which no entries are made until the partners advance their shares; and three in which entries are made previous to the shares being paid in: in the latter, an "Account Proper" being opened with each partner, for recording the sums drawn or paid in, distinct from the "Account in Company" for his share.

1. *Cash*, or the *Article* advanced, Dr. to Stock,
   —then
   Stock Dr. to Sundries.
   To each partner for his share.
2. *Sundries Drs. to the Partner.*
   For the articles paid in.
3. *Sundries Drs. to Stock in Company.*
   For the articles paid in, mentioning each partner's share.
4. *Stock Dr. to Sundries.*
   To each partner's *Account in Company*, for his proposed capital; then
   Sundries Drs. to Stock.
   Each partner's *Account Proper* for the same.
5. Each partner's *Account Proper* Dr. to each partner's *Account in Company*, for the capital to be advanced.
6. *Sundries Drs. to Stock in Company.*
   Each partner's Account Proper for the proposed capital; and

when the partners pay in their respective shares, the entry by all the three last is "Cash" or the Article advanced Dr. to partners' Account Proper. On balancing the books, if the business has been successful, and the profit is to be divided, enter "Profit and Loss" Dr. to each partner's Account Proper; but if there has been a loss, these entries are to be reversed. The balance of the Account Proper is then usually transferred to the Account in Company when the latter is kept separate, and it is not fixed that the capital shall remain permanent. In all cases, interest is to be charged on the partners' accounts, in order to equalize their advances.

Joint Capital is debited at the outset to each of the partners for his capital; at balancing it is debited to "Interest" for the interest arising on the capital; to "Profit and Loss" for gain; and credited by each of the partners' accounts for the sums withdrawn. It is thus just the Stock Account of the General Ledger reversed.

Interest is credited by "Joint Capital" for the interest arising on it; and debited to the partners for their respective shares.

Profit and Loss is credited by "Joint Capital" for net gain; and debited to the partners' accounts for their respective shares.

Partners' Accounts are credited by "Joint Capital," "Interest," and "Profit and Loss," for their respective shares of capital, interest, and gain, and debited to "Joint Capital" for the sums withdrawn.

III. *Outline of a Single Entry System adapted for Retail business.*

In the simple form given below, the only books employed are a Cash Book, a Day Book, and a Ledger, into which the two former are posted directly without the intervention of a Journal. The *Cash Book* differs from ordinary books of this kind in having an inner column on each side titled "Store." In the inner column on the Dr. side are entered the cash drawn for ready-money sales and discounts received; and in the Cr. inner column, ready-money purchases, discounts allowed or paid, and all charges of a general nature. The amount of each of the inner columns is transferred monthly to the outer, and then posted to "Store Account" in the Ledger. In the annexed form the ready-money sales are entered weekly, but in practice they should be entered daily unless a petty cash book is kept for that purpose; in which case they may be transferred when convenient. The *Day Book* forms a chronological record of all the other transactions; the purchases on credit are extended into the column titled "Store Dr.;" the sales on credit to that entitled "Store Cr.," and any other transactions which may occur are expressed in the journal form, and entered in an inner column. The two outer columns are summed up monthly, and their amounts posted to "Store Account," as before. The *Ledger* is extremely simple, and will be readily understood on inspection. The "Store Account" combines a goods and charges account; and at closing, the value of the goods at hand, as ascertained by inventory, is stated to the credit as a balance, and the excess of the credit above the debit side, being the profit realized, is transferred to "Stock Account." The period embraced by the transaction is one month, but the procedure is the same throughout the year. The operation of balancing is here for illustration performed at the end of the month, when closing stock entries are stated in the journal form at the end of the Day Book.

Dr. CASH BOOK. *Cr.*

Feb. 1	To Stock,			$2500	00
" 7	To Store, Cash Sales,	$75	00		
" 8	To Store, disc't fr. J. Smith,	50	00		
" 14	To Store, Cash Sales,	80	00		
" "	To J. Bell, in full,			60	00
" 21	To Store, Cash Sales,	60	00		
" 25	To Bills Receivable, disc't P. Brown's, due 18th June,			300	00
" 28	To Store, Cash Sales,	70	00	335	00
				$3195	00

Feb. 1	By Bank, deposited,			$1425	00
" 3	By Store, 400 lbs. Tea @ 50c.,	$200	00		
" 8	By J. Smith, paid him,			1000	00
" 13	By A. B, family expenses,			25	00
" 14	By Store, disc't to J. Bell,	5	00		
" 25	By Store, disc't on P. B.'s bill,	5	00		
" 28	By Store, incidentals, etc.,	60	00	270	00
" "	By A. B., family expenses,			30	00
" "	By Balance,			445	00
				$3195	00

DAY BOOK.

Date			Store. Dr.		Store. Cr.	
Feb. 2	To John Smith, for 2,000 lbs. Tea at 50c.,		$1000	00		
" 5	By J. Bell, 100 lbs. Tea at 60c ,				$60	00
" 10	To J. Smith, 100 cwt. Sugar at $12.50,		1250	00		
" 15	By J. Bell, 20 cwt. Sugar at $15.00,				300	00
" 20	Bills Receivable, Dr. to J. Bell,					
	Received his bill at 4 mos., due 18th June,	$300				
" 28	By J. Bell, for 10 lbs. Tea at 50c.,	5				
	" 50 lbs. Sugar at 10c.,	5			10	00
	Store Account Dr. for purchases on credit this month,		$2250	00		
	Store Account Cr. for sales on credit this month,				$370	00
	Stock Dr. to A. B., private account, balance of latter transferred,	55				
	Store Account Dr. to Stock, gain on former transfer,	$105				

LEDGER.

Dr. — Cr.

STOCK.

Dr.					Cr.		
Feb. 28	To A. B. for Cash withdrawn,	$55	00	Feb. 1	By Cash for Capital,	$2500	00
" "	To Balance,	2550	00	" 28	By Store for gain,	105	00
		$2605	00			$2605	00

STORE.

Dr.					Cr.		
Feb. 28	To Cash,	$270	00	Feb. 28	By Cash for Sales, etc.,	$335	00
" "	To Sundries per Day B.,	2250	00	" "	By Sundries, Sales per Day B.,	370	00
" "	To Stock for gain,	105	00	" "	By Balance, Goods on hand	1920	00
		$2625	00			$2625	00

BANK.

Dr.					Cr.		
Feb. 1	To Cash deposited,	$1425	00	Feb. 28	By Balance,	$1425	00

BILLS RECEIVABLE.

Dr.					Cr.		
Feb. 20	To J. Bell, due June 18th,	$300	00	Feb. 25	By Cash,	$300	00

A. B., PRIVATE ACCOUNT.

Dr.					Cr.		
Feb. 13	To Cash, personal expenses,	$25	00	Feb. 28	By Stock transferred,	$55	00
" 28	do. do.	30	00				
		$55	00			$55	00

JOHN SMITH.

Dr.					Cr.		
Feb. 8	To Cash, Disc't $50	$1000	00	Feb. 2	By Store, 2000 lbs. Tea at 50c.,	$1000	00
" 28	To Balance,	1250	00	" "	100 cwt. Sugar at $12.50,	1250	00
		$2250	00			$2250	00

J. BELL.

Dr.					Cr.		
Feb. 5	To Store, 100 lbs. Tea at 60c.,	$60	00	Feb. 14	By Cash, disc't $5	$60	00
" 15	To Store, 20 cwt. Sugar at $15,	300	00	" 20	By Bills Rec. due June 18th,	300	00
" 28	To Store, Tea and Sugar,	10	00	" 28	By Balance,	10	00
		$370	00			$370	00

BALANCE (A. B.'S ESTATE, FEB. 28).

Dr.			Cr.		
To Cash on hand	$445	00	By J. Smith, due to him,	$1250	00
To Store, goods on hand,	1920	00	By Stock,	2550	00
To Bank,	1425	00			
To J. Bell, due by him,	10	00			
	$3800	00		$3800	00

Book Muslin, a thin kind of muslin, of which there are several kinds made, for dresses, curtains, etc., as saccharillo, tarlatan, leno, etc.

Bookseller, a dealer in books, who frequently combines the business of publisher and stationer. See Book.

Book-Trade. See Book.

Boom, a projecting spar in a ship run out amidship or fore and aft, as a jib-boom on the bowsprit, studding-sail boom to the yards, etc.—The hard straw of flax.

Boomerang, a peculiar-shaped native Australian missile which recoils when thrown.

Boon, is the central wood-like part of the flax-stem. Its binding mucilage being softened by fermentation in the operation of *retting*, the *B.* is partially removed in *grassing*, and together with the *shives* is afterwards completely eliminated from the *hare* or fibre in the operations of *braking* and *scutching*.

Boornous, a woollen cloak with hood and without sleeves, worn by the Arabs.

Boort, or Bort, a trade-name for a kind of imperfectly crystallized diamonds which come from Brazil, and, after being broken and reduced to powder, are used as a material for polishing other stones. Their value in New York is about $6 per carat.

Boot, [Fr. *botte;* Ger. *stiefel*,] a covering for the foot and lower part of the leg, usually made of leather. The manufacture of boots and shoes has undergone in our time remarkable changes, which have converted shoemaking from a domestic to a factory trade. In 1844, M. Lefèvre, of Paris, invented a machine for fastening the sole and the welt by brass screws, made out of a continuous length of wire; other inventions followed, and now

machinery is employed in nearly all the operations connected with the business, some of the finest kind of work being, however, still made by hand. These machines, several of which are examples of American ingenuity, are very numerous. A machine for *pegging* boots and shoes, instead of sewing them, cuts the wire into pegs, presses the sole firmly against an iron last, guides a peg against the sole, presses it through the leather with great force, and clinches it against the iron sole. The *clicking* machine greatly expedites the cutting out and binding of the linings; while another machine models the instep pieces. The *blocking* apparatus expedites the process of blocking the uppers. One machine will cut soles at the rate of 60 a minute; another will split leather into two thicknesses, instead of paring it away with a knife. The *Eureka heel-trimming machine*, patented in 1875 by J. K. Krieg & Co., of New York (Fig. 40), trims about 1,000 pairs a day, without damaging the finest upper, either leather or cloth.

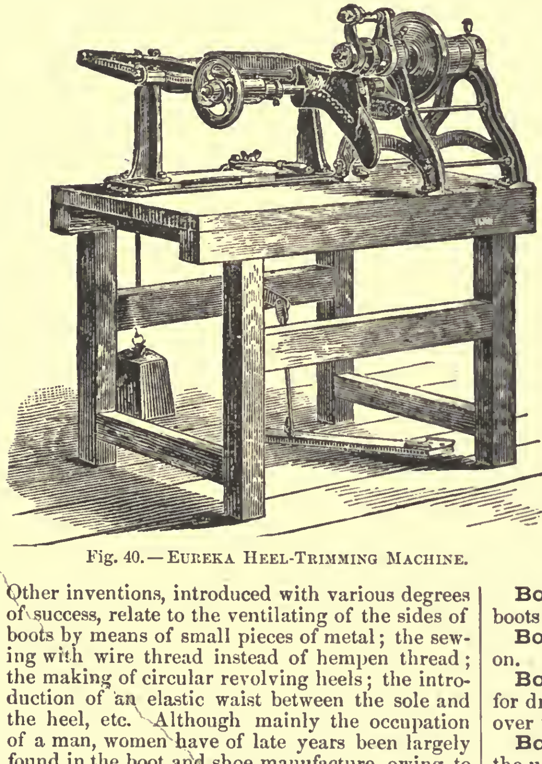


Fig. 40.—Eureka Heel-Trimming Machine.

Other inventions, introduced with various degrees of success, relate to the ventilating of the sides of boots by means of small pieces of metal; the sewing with wire thread instead of hempen thread; the making of circular revolving heels; the introduction of an elastic waist between the sole and the heel, etc. Although mainly the occupation of a man, women have of late years been largely found in the boot and shoe manufacture, owing to the universal use of the sewing-machine, which can be applied to stiff leathers just as well as to the most delicate muslin. In many factories there are women who, by various ingenious machines, close the uppers, sew on the welts and insoles, "last" the boots at the rate of one hundred and fifty pairs per day, and tack on and stitch the soles. There are in England, Germany, and France, large establishments where ranges of sewing-machines are employed in boot- and shoe-making, but it is in this country that real factories for such work have been most extensively and successfully established, and the boot- and shoe-making business has become a very important branch of American manufacture and exports. Boston is the chief mart, but large shipments are also made from Philadelphia, New York, and Baltimore. Boots are usually packed in cases containing 12 pairs, and shoes in cases containing either 60 or 120 pairs. Boot-making is not usually considered a healthy occupation. Factory work is for obvious reasons better than hand work in crowded rooms, where the want of ventilation, the sedentary occupation, and the constrained position tell hardly against a good many. The riveters are said to suffer from nervous affections, from the noise caused by the hammering; and the habit of putting the brass nails into the mouth tends to produce excoriations which are rather difficult to heal. The machinists suffer more in boot work than in ordinary sewing, owing to the heavy character of the double-action machine. Many of the workers on patent or enameled leather are liable to affections of the eyes, induced partly by the quantity of gas which is kept burning in the machinists' room. In 1878, the U. S. exports of boots and shoes, chiefly to Germany, England, Holland, Mexico, Cuba, and S. America, summed $351,152. *Imp.* duty, 35 per cent.

Boot- and Shoe-Lacings, cotton or silk braid, with ends secured and covered with metal.

Boot-Back, the hinder leather of long boots, sold ready shaped for making up.

Boot-Crimp, in boot-making, a tool or a machine for giving the shape to the pieces of leather designed for boot-uppers, which is made by softening, straining the leather over a former, and rubbing down the parts, which would be *crimped* or rugged, if the material was not compacted at that point.

Bootee, a white, spotted East India muslin.

Boot-Fronts, the calf-skin leather fronts for long boots. They are imported — cut, shaped, and crimped — from France. *Imp.* duty, 35 per cent.

Booth, a large canvas tent or pavilion.

Boot-Hooks, holdfasts for drawing long boots on the feet, consisting essentially of a stout wire bent into a hooked form, and provided with a handle.

Boot-Jack, a contrivance for taking off long boots by a pressure at the heel.

Boot-Rack, a stand to place boots and shoes on.

Boot-Shank Machine, a boot-maker's tool for drawing the leather of the upper or boot-leg over the last into the hollow of the shank.

Boot-Stretcher, a contrivance for stretching the uppers of boots and shoes. It usually consists of a two-part last, horizontally divided, and provided with a wedge, and sometimes a screw, to expand them after they are inserted in the boot.

Boot-Topping, the process of scraping a vessel's bottom to clear it from accumulated weed, etc., and daubing it with tallow, or some other mixture.

Boot-Tree, an instrument for stretching the leg of a boot, consisting of two wooden blocks which together form the shape of the leg and foot, and which, after being introduced in the boot, are driven apart by a wedge.

Boquin, a coarse sort of Spanish baize.

Boracic Acid, occurs in small brilliant color-

less crystals, which have a greasy feel; it is inodorous, and possesses little taste. It is obtained artificially by the action of sulphuric acid upon borax; and in a natural state in the hot springs of Sasso, near Florence. It is used in the manuf. of borax, as a flux in metallurgic operations, in making enamel, etc. *Imp.* free.

Borate of Lime, a mineral containing about 50 per cent of boracic acid, imported from Peru for the manuf. of refined borax. *Imp.* free.

Borax, a salt procured in an impure state, called *tincal*, or *rough borax*, from a lake in Thibet, and exported by way of Calcutta. Tincal is imbedded in a kind of soapy matter; its crystals are soft and brittle, colorless, yellowish or greenish, sometimes nearly transparent, but more commonly opaque. When purified, it is called *B.*, or *borate of soda*, and occurs in rather large, white semi-transparent crystals, having a sweetish alkaline taste. *B.* is also prepared artificially in the U. States from boracic acid, soda, and borate of lime. This salt is employed in medicine, but it is chiefly used as a flux in the arts, as a constituent of the glazes in porcelain, and in the manuf. of glass. *Imp.* duty (crude, or tincal), free, (refined) 10 cts. per lb.

Bordeaux. See FRANCE.

Bordeaux Wines. See CLARET.

Border, a printers' type with an ornamental face, suitable for forming a part of a fancy border; ornamental work surrounding the text of a page. —The rim of a lock.—That part of cloth containing the selvage.

Bore, [Fr. *âme*; Ger. *bohrloch*,] the hollow cavity of a cannon, barrel of fire-arm, steam-engine cylinder, pump-barrel, pipe, wind-instrument, etc. It is expressed in mechanics in inches of diameter; in cannon in inches of diameter, as 8-inch gun, or in the weights in pounds of solid round shot adapted thereto, as 8 dr. 12 oz. etc.; in small-arms, in hundredths of an inch decimally, thus: 44, 55, in which it is termed *caliber*; in sporting-rifles by the number of balls to the pound; in smooth-bore fowling-pieces by a trade number, as Nos. 9, 10, 11, etc.—The capacity of a boring-tool; as, the *bore* of an auger.

Borecole, a winter cabbage.

Borer, in coopering, a semi-conical tool used to enlarge bung-holes and give them a flare.

Borilla, a rich copper ore in dust.

Boring-Machine, the apparatus used in seeking for water in the soil.—A cutting or edged tool for smoothing the internal surface of cast-iron cylinders.—In a general sense, any machine by which holes are made by the revolution of the tool or of the object around the tool, including any boring-tool with the machinery for driving it, as an auger with its handle, etc. See DRILL.

Borneo. See MALAYAN ISLANDS.

Bort. See BOORT.

Bosh, stuff; a name in England for mixed or adulterated butter.

Boss, a stud or knob, a protuberant ornament on harness, etc.—A master who takes in work at his own house from a manufacturer, and employs others to execute it.

Boston, a great city and seaport of the U. States, capital of the State of Massachusetts, and the metropolis of New England, lies in lat. 42° 21′ 24″ N., lon. 71° 3′ 58″ W., and occupies a commanding position at the western extremity of Massachusetts Bay, on the Charles River, 44 m. N. N. E. of Providence, and 232 m. N. E. of New York. *Pop.* in 1875 (State census), 341,919. The city includes, besides *B.* proper, South *B.*, East *B.*, Roxbury, Dorchester, Charlestown, West Roxbury, and Brighton. *B.* proper, or old *B.*, occupies a peninsula, joined to the main land on the south by a narrow strip of land known as the Neck, which was once overflowed by the tides, but has been raised and widened. The harbor is a spacious indentation of Massachusetts Bay, the mouth of which lies between Point Alderton on Nantasket and Shirley in Chelsea. It embraces about 75 sq. m., and includes several arms, such as Dorchester Bay, South *B.* Bay, and the embouchures of Charles, Mystic, and Neponset rivers. A part of Charles River is commonly known as the Back Bay. There are more than 50 islands or islets in the harbor. The main entrance to the harbor is between Castle and Governor's islands; it is very narrow, and is defended by Forts Independence and Warren. The harbor is open at all seasons, and its deep-water front can afford accommodations for the loading of a number of vessels without delay. It affords anchorage for 500 vessels of the largest class, and has 75 capacious docks which are the property of the port, and since their establishment, in the time of Queen Anne, the receipts from them have been applied to their perfection and increase. There are stationary elevators under which foreign steamers can be loaded. *B.* has a very extensive trade with the Southern States and with foreign countries. Great progress has been made of late in competing for the export trade, and the opening of the "Through Business" (see this word), which was first inaugurated in *B.*, has already acted very favorably on her shipping interests. The great centres for distribution for the Western crops of the U. States are now in Europe, and *B.* claims to be the shortest and cheapest line between producer and consumer, from Chicago and the great Northwest to England and the Continent. *B.* ranks next to New York in extent of imports, and third among the cities of the Union in the value of foreign commerce, New York being first and New Orleans second. Eight lines of railroad terminate in *B.*, viz., the Fitchburg, the Easton, the *B.*, Lowell, and Nashua, the *B.* and Maine, the *B.* and Providence, the *B.*, Hartford, and Erie, the *B.* and Albany, and the Old Colony and Newport. By means of the Grand Junction railroad, the main line of the Boston and Albany is connected with the Fitchburg, Lowell, Eastern, and Boston and Maine railroads, and with the Grand Junction wharf at East Boston, which greatly facilitates the transfer of freight to and from vessels. There are numerous lines of steamers to the principal Eastern ports of the U. States and Canadas. In 1871 not a steamship cleared from *B.* for any foreign port. The Cunard steamers, then the only line touching *B.*, made a triangular passage, bringing freight and passengers and loading for the return trip partly in New York and partly in *B.* Now, 4 steamship lines—the Warren, Leyland, Cunard, and Sears lines—make direct connection between *B.* and Liverpool, and others are in contemplation for business between *B.* and British and European ports to which there are now but occasional steamers. In 1878 the total value of the commerce of *B.* was $87,055,255, the imports being $36,679,863 (a decrease of $11,037,359 on 1877), domestic exports $49,195,077, foreign exports $1,180,315 (in-

crease on exports $7,168,051); 607 American vessels, of 259,476 tons, and 1,502 foreign vessels, of 679,614 tons, entered the port; and 539 American vessels, of 206,096 tons, and 1,370 foreign vessels, of 581,609 tons, cleared the port; 55 American and 220 foreign ocean steamers entered, and 38 American and 180 foreign cleared; 779 steamers and 204 sailing-vessels entered on the coastwise trade, and 819 steamers and 537 sailing-vessels cleared. There were belonging to the port 893 vessels with an aggregate tonnage of 302,429, and 92 steamers with an aggregate tonnage of 23,699. In 1878 fourteen ships, barks, etc., and four steamers, with an aggregate tonnage of 8,156, were built in *B.*, and her immediate vicinity.—According to the latest returns of the industry of Massachusetts, the chief manuf. establishments of Boston were 49 cabinet-ware factories, 38 manuf. of machinery, 38 book-publishing houses, 89 printing establishments, 31 hat and cap factories, 30 bookbinderies, 29 manuf. of watches, 28 of cars, carriages, etc., 17 of pianos, 17 of upholstery, 12 brass and 7 type and stereotype foundries, 9 glass factories, 4 of organs, melodeons, and harmoniums, 4 of paper collars, 3 of sewing-machines, and 2 of chemicals.—*B.* has 61 National banks, with an aggregate cap. of $54,675,000; and about 30 fire and marine insurance cos., besides life insurance cos., and those against accidents.

TABLE OF THE TRADE OF B. WITH FOREIGN COUNTRIES IN 1878.

	Imports.	Exports.
Argentine Republic	$2,947,809	
Austria	....	$107,248
Belgium	199,320	700,978
Brazil	542,026	31,686
Chili	311,945	1,014,349
China	123,715	
Denmark, etc.	....	19,832
Danish West Indies	16,285	76,770
France	21,913	125,348
French West Indies	439,836	538,860
French Possessions in Africa	79,746	184,447
Germany	1,533	104,141
Great Britain	17,504,821	35,997,297
Great Britain, North America	1,876,855	3,514,362
Great Britain, West Indies	1,154,721	389,186
Great Britain, Hong Kong, and East Indies	2,184,541	231,475
Great Britain, Africa	1,120,709	1,148,897
Great Britain, Australia	501,042	1,163,707
Hawaiian Islands	8,858	87,107
Hayti	260,483	686,482
Italy	751,602	
Liberia	37,687	24,462
Mexico	28,259	
Holland	42,631	159,048
Holland, Dutch West Indies	333,688	205,854
Holland, Dutch East Indies	1,129,135	114,409
Peru	96,295	
Portugal	....	13,000
Portugal, Azores, Madeira, etc	42,926	359,513
Russia on the Baltic	465,900	10,700
San Domingo	176,812	22,567
Spain	26,706	8,335
Spain, Cuba	4,559,228	181,404
Spain, Porto Rico	696,810	53,235
Spain, all other Possessions	2,216,578	26,668
United States of Colombia	4,170	32,186
All other Countries in Africa	288,625	614,493

The leading articles of imports and exports in 1878 were as follows:

Boots and Shoes: The total shipments, 1,648,724 cases, against 1,758,025 cases in 1877, and 1,521,205 in 1876. *Butter and Cheese:* Exports, 26,500,000 lbs. butter and 138,500,000 lbs. cheese. *Cotton:* Imports, 354,423 bales, against 350,979 in 1877, and 308,327 in 1876; exports to foreign ports, 122,015 bales, against 88,548 in 1877, and 68,057 in 1876. *Cotton goods:* 21,111 packages, against 30,175 in 1877, and 36,169 in 1876. *Fish:* The fresh fish trade has assumed large proportions. 29 wholesale firms are engaged in the business, employing over a million dollars capital. During the past year they handled 883,383 lbs. salmon, 11,092,463 lbs. cod, 15,728,342 lbs. haddock, 394,982 lbs. cusk, 688,718 lbs. hake, 577,465 lbs. pollock, 2,353,574 lbs. blue fish, 327,382 lbs. sword fish, 3,758,112 lbs. halibut, 3,736,076 lbs. mackerel, and 4,491,438 lbs. herring, besides numerous other varieties of less note, nearly all of which have been disposed of fresh, and distributed to all parts of the country. *Flour* (including corn-meal): Receipts, 1,888,395 bbls; exports, 474,439 bbls. *Grain:* The exports of corn and wheat in 1876–1878 were as follows:

	1878.	1877.	1876.
Corn ....bushels.	6,669,138	3,182,844	4,160,817
Wheat .... "	3,888,609	1,612,814	112,915

Hemp and Jute: 14,216 bales were imported, against 47,447 in 1877, and 81,875 in 1872. The trade in Manila and Sisal hemp, Calcutta Jute, and Jute butts, was as follows:

	Imported.	Stock from 1877.	Consumed.
Manila hemp....bales	114,783	41,155	127,394
Sisal hemp...... "	59,691	13,028	49,074
Calcutta Jute... "	45,181	16,280	39,093
Jute butts and rejections...... "	191,227	21,267	183,627

Hides: the imports were 1,787,412 hides and 27,701 goat-skins. *Ice:* exports 53,180 tons. This trade, which is a *B.* invention, has considerably declined within a few years. *Iron:* foreign imports, 711,799 bars and 64,812 bundles. *Lead:* 45,268 pigs. *Leather:* exports, 1,287,745 sides. *Live Stock:* the total number of beasts reported at market were 188,385 cattle, 372,787 sheep, 15,874 veals, 509,884 fat hogs, and 548 pigs. The total shipments of live stock to Europe, which is a comparatively new business, were 34,658 cattle, 27,905 sheep, 13,680 hogs, and 207 horses. *Nails:* exports, 64,873 casks (range of price, $2.20 to $2.50). *Petroleum:* exports, 4,150,074 gallons. *Salt:* imports, 2,179,964 bushels. *Spirits:* imports (chiefly from England, Holland, and Belgium), 94,808 gallons; export of New England rum, 1,048,018 gallons. *Sumac:* imports, 37,819 bags. The trade was as follows:

	Hhds.	Bales & Cases.	Boxes & Kegs.
Imports..............	10,963	2,471	16,363
Exports..............	14,135	4,310	4,926

Tin: imports, 9,915 pigs, and 180,794 boxes tin plates. *Wine:* imports, 120,864 gallons (86% from England). *Wool:* receipts of domestic wool, 255,931 bags and bales; imports of foreign wool, 30,833 bales. The receipts of wool embrace about one-third the entire clip of the country, while the average weekly sales amount to about 1,000,000 lbs. The stock of domestic wool on hand in *B.* Jan. 1, 1879, was 13,990,201 lbs., against 12,647,480 in 1878. The stock of foreign wool on hand Jan. 1, 1879, was 2,989,800 lbs., against 2,847,800 in 1878. *B.* has also a considerable trade in dry-goods and clothing.

How to Enter the Port, and Mooring.—In coming from the Atlantic, a ship should bring the lighthouse to bear W. by N. to W.N.W., and run direct for it. The largest ships may pass it at within less than a cable's length. If there be no pilot on board, or the master be unacquainted with the harbor, or the wind be north-westerly, which is the most unfavorable for entering, she had better steer W. by S. for Nantucket Roads, where she may anchor and get a pilot. There is sufficient depth of water to enable the largest ships to come up to the town at all times of the tide. They usually moor alongside quays or wharves, where they lie in perfect safety.

Pilotage.—No particular place is specified at

which vessels must heave to for a pilot. But all vessels, with the exception of coasters under 200 tons, and American vessels laden with plaster of Paris from British America, if hailed by a pilot within about 1½ mile of the outer light, must take him on board under a penalty of $50. If they have got within this distance before being hailed, the obligation to take a pilot on board ceases. This regulation has obviously been dictated by a wish to have the pilots constantly on the alert; it being supposed that masters not well acquainted with the bay will heave to to take one on board, though they have got within the free limits.

Careening, Stores, etc. — Boston is a very favorable place for careening and repairing ships. All kinds of supplies may be had of the best quality and at moderate prices.

Fig. 41.—FANEUIL HALL.
(The Cradle of American Independence.)

Boston and Albany R.R., from Boston, Mass., to Albany, N. Y., 201·65 m.; branches, 47·98 m.; leased lines, 72·11 m.; total, 321·74 m. Offices, Boston, Mass. This Co. was formed in 1867, by the consolidation of the Boston and Worcester, and Western (of Mass.) R.R. Co.'s, with all their branches and leased lines. *Financial Statement:* Cap. stock, $20,000,000; funded debt, 7% bonds, $5,000,000, payable 1892; and 6% bonds, $2,000,000, payable 1895.

Boston and Lowell R.R., runs from Boston to Lowell, Mass., 26·75 m.; branches, 19·21 m.; leased lines, 37·23 m.; total, 83·19 m. This Co., whose offices are in Boston, was organized in 1830, and in 1857 made a contract with Nashua and Lowell R.R. Co. for joint operation of roads and branches. This combination embraces six small R.R. in Mass., and three in N. H. Legislative authority has been obtained, in both these States, to consolidate all these lines into one corporation. *Financial Statement:* Cap. stock, $3,250,000; funded debt, $2,124,500; notes payable, $407,000; contingent fund, $491,776.24. Funded debt in detail: Bonds (unsecured) issued 1864, $200,000, payable 1879, interest 6% (April and Oct.); issued 1872, $999,500, payable 1892, interest 7% (April and Oct.); issued 1875, $500,000, payable 1895, interest 7% (March and Sept.); issued 1876, $425,000, payable 1896, interest 6% (Jan. and July).

Boston and Maine R.R., runs from Boston, Mass., to Portland, Me., 115·50 m.; branches, 11 m.; leased lines, 79·84 m.; total, 206·34 m. This Co., whose offices are in Boston, was formed in 1842 by the consolidation of the Boston and Portland R.R. Co., the Boston and Maine R.R. Co., and the Maine, New Hampshire, and Massachusetts R.R. The road was opened to Portland in 1873. *Financial Statement,* 30th Sept., 1877: Cap. stock, $6,921,274.52; funded debt, $3,500,000; notes payable, $32,009.08; sundry accounts, $46,-233.17; profit and loss, $1,433,148.70. Funded debt in detail: Bonds issued 1873, $1,500,000, payable 1893, interest 7% (Jan. and July); bonds issued 1874, $2,000,000, payable 1894, interest 7% (Jan. and July).

Boston and New York Air-Line R.R. This Co., with offices in New Haven, Conn., runs from New Haven to Willimantic, Conn., 54 m., 50 being owned by the Co., and leases the Colchester R.R., 3·59 m.; total, 57·59 m. *Financial Statement:* Cap. stock, preferred, $2,225,000; Ditto. common and scrip, $695,706.81; funded debt, $488,000; sundry accounts, $55,998.98; profits and loss, $3,838,247.

Boston and Providence R.R., runs from Boston, Mass., to Providence, R. I., 44 m.; branches, 18·54 m.; leased Attleboro Branch R.R., 4 m.; total, 66·54 m. This Co., whose offices are in Boston, was chartered in 1831 and completed in 1835. It bought in 1873 the Providence, Warren and Bristol R.R. in connection with the Fall River, Warren and Providence R.R., which latter it transferred to the Old Colony R. R. It also owns with the latter Co. the Union Freight Co. in Boston. *Financial Statement* 30th Sept., 1878: Cap. stock, $4,000,000; funded debt, 7% bonds due 1893, $500,000; notes payable, $500,000; dividends, $125,408; sundry accounts, $51,934.73; profit and loss, $363,127.39; net earnings for 1878, $293,358.88.

Boston, Clinton, Fitchburg and New Bedford R.R., from Fitchburg to New Bedford, Mass., 91·02 m.; branches, 34·31 m.; leased lines, 26·12 m.; total, 151·45 m. This Co., whose offices are in New Bedford, was organized in 1876 by the consolidation of the B., C. and F. and the N. B. R.R.'s. *Financial Statement:* Stock, $2,583,-500; funded debt, $3,169,100; notes payable, $2,355,576.62; sundry accounts, $257,991.16; balance and outstanding bills, $79,485.86. Funded debt in detail: Mortgages, $171,500 payable 1881, interest 6% (Jan. and July); $400,000 payable 1884, interest 6% (Jan. and July); $547,-600 payable 1889, interest 7% (Jan. and July); $252,000 payable 1890, interest 7% (Jan. and July); $400,000 payable 1894, interest 7% (Jan. and July); $270,000 payable 1881, interest 8% (April and Oct.); $250,000 payable 1882, interest 8% (April and Oct.); $280,000 payable 1883, interest 8% (April and Oct.); $100,000 payable 1885, interest 8% (Feb. and June); $528,000 payable 1896, interest 7% (May and Nov.).

Boston, Concord, Montreal, White Mountains, and Mt. Washington Branch R.R., runs from Concord to Groveton Junction, 146·17 m., with branch from Wing Road to Mount Washington, 20·39 m.; total, 166·56 m. Offices in Plymouth, N. H. This Co. was chartered in 1844; the White Mountains (N. H.) R.R. was consolidated with it in 1873. *Financial Statement:* Cap. stock, $1,800,000; funded debt, $2,528,000; unpaid coupons and dividends, $19,487; profit and loss,

$582,414; net earnings for year ending March 31, 1878, $201,100.36.

Botargo, a sausage made on the shores of the Mediterranean and the Black Sea, of the roe of the mullet. The best come from Tunis and Alexandria.

Botschka, the butt or pipe of Russia; a liquid measure containing 40 vedros, and equal to rather more than 108¼ gallons.

Botta, a very variable liquid measure in Italy, in some towns only 106 wine gallons; in others as much as 246 gallons.

Botte, the French name for a boot; a truss or bundle.

Bottle, [Fr. *bouteille, flacon;* Ger. *bouteillen, flasche;* It. *bottiglia;* Por. *botelha;* Sp. *botella,*] an earthenware or glass vessel of various sizes for holding liquor, too well known to require any description. Glass bottles come from Europe, principally from France and Germany, filled with wine or other liquid; they are also sometimes imported empty in hampers. The smallest description of glass bottles, called *vials*, and used by druggists, perfumers, etc., are extensively manuf. in the U. States. See GLASS.

Imp. duty (plain), 35 per cent.; the same, filled with articles not otherwise provided for, 30 per cent.; (cut, engraved, painted, colored, stained, silvered, or gilded glass), 40 per cent. "In all cases where glass bottles or jars containing imported merchandise are not specially provided for in the statute as such, the duty of 30 per cent. ad valorem imposed by Schedule B shall be exacted on such glass bottles or jars, independent of the rate of duty assessed on the contents, or the fact that the contents are free of duty."—(Decision of the Treasury Dep., March, 1879.)

Bottled, wine, beer, or other commercial liquor put up in bottles.

Bottle-Glass, the commonest kind of green glass.

Bottle-Jack, an old mechanical clock-work contrivance for roasting, the machinery of which being wound up, kept the suspended joint revolving before the fire.

Bottle-Rack, a wooden frame with open shelves to place bottles on to drain.

Bottom, a shipping term for that portion of a ship which is under water, or the ship itself, as "trade in foreign *bottoms*."

Bottoming. See BALLASTING.

Bottomry and **Respondentia**, a contract in the nature of a mortgage, by which the owner of a ship, or the master, as his agent, borrows money for the use of the ship, and for a specified voyage, or for a definite period, pledges the ship as a security for its repayment, with maritime or extraordinary interest on account of the marine risks to be borne by the lender; it being stipulated that if the ship be lost in the course of the specified voyage, or during the limited time, by any of the perils enumerated in the contract, the lender shall also lose his money. *B.* differs materially from an ordinary loan. Upon a simple loan the money is wholly at the risk of the borrower, and must be repaid at all events. But in *B.* the money, to the extent of the enumerated perils, is at the risk of the lender during the voyage on which it is loaned, or for the period specified. Upon an ordinary loan, only the usual legal rate of interest can be reserved; but upon *B.* and *respondentia* loans, any rate of interest, not grossly extortionate, which may be agreed upon, may be legally contracted for. When the loan is not made upon the ship, but on the goods laden on board and which are to be sold or exchanged in the course of the voyage, the borrower's personal *responsibility* is deemed the principal security for the performance of the contract, which is therefore called *respondentia.* And in a loan upon respondentia, the lender must be paid his principal and interest though the ship perish, provided the goods are saved. In most other respects the contracts of *B.* and of *respondentia* stand substantially upon the same footing. *B.* bonds may be given by a master appointed by the charterers of the ship, by masters necessarily substituted or appointed abroad, or by the mate who has become master on the death of the appointed master. If the bond be executed by the master of the vessel, it will be upheld and enforced only upon proof that there was a necessity for the loan, and also for pledging the credit of the ship; as the authority of the master to borrow money on the credit of the vessel rests upon the necessity of the case, and only exists under such circumstances of necessity as would induce a prudent owner to hypothecate his ship to raise money for her use. If the master could have obtained the necessary supplies or funds on the personal credit of himself or of his owner, and this fact was known to the lender, the bond will be held invalid. And if the master borrows on *B.* without apparent necessity, or when the owner is known to be accessible enough to be consulted upon the emergency, the bond is void, and the lender can look only to the personal responsibility of the master.

The contract of bottomry is usually, in form a bond (termed a *B.* bond), conditioned for the repayment of the money lent, with the interest agreed upon, if the ship safely accomplishes the specified voyage, or completes in safety the period limited by the contract. Sometimes it is in that of a bill of sale, and sometimes in a different shape; but it should always specify the principal lent and the rate of maritime interest agreed upon; the names of the lender and borrower; the names of the vessel and of her master; the subject on which the loan is effected, whether of the ship alone, or of the ship and freight; whether the loan is for an entire or specific voyage or for a limited period, and for what voyage or for what space of time; the risks the lender is contented to bear; and the period of repayment. It is negotiable. In case a highly extortionate or wholly unjustifiable rate of interest be stipulated for in a *B.* bond, courts of admiralty will enforce the bond for only the amount fairly due, and will not allow the lender to recover an unconscionable rate of interest. But in mitigating an exorbitant rate of interest they will proceed with great caution. Not only the ship, her tackle, apparel, and furniture (and the freight, if specifically pledged), are liable for the debt in case the voyage or period is completed in safety, but the borrower is also, in that event, personally responsible. The borrower on *B.* is affected by the doctrines of seaworthiness and deviation; and if, before or after the risk on the *B.* bond has commenced, the voyage or adventure is voluntarily broken up by the borrower, in any manner whatsoever, whether by a voluntary abandonment of the voyage or adventure, or by a deviation or otherwise, the maritime risks terminate, and the bond becomes presently payable. But maritime interest is not recoverable if the risk has not commenced. The lien or privilege of a *B.* bondholder, like all other maritime liens, has, ordinarily, preference of all prior and subsequent common-law and statutory liens, and binds all prior interests centring in the ship. It holds good

(if reasonable diligence be exercised in enforcing it) as against subsequent purchasers and common-law incumbrancers; but the lien of a *B.* bond is not indelible, and, like other admiralty liens, may be lost by unreasonable delay in asserting it, if the rights of purchasers or incumbrancers have intervened. Between the holders of two *B.* bonds upon the same vessel in respect to different voyages, the latter one, as a general rule, is entitled to priority of payment out of the proceeds of the vessel.

Seamen have a lien, prior to that of the holder of the *B.* bond, for their wages for the voyage upon which the bottomry is founded, or any subsequent voyage; but the owners are also personally liable for such wages, and if the *B.* bondholder is compelled to discharge the seamen's lien, he has a resulting right to compensation over against the owners, and has been held to have a lien upon the proceeds of the ship for his reimbursement. But in England and America the established doctrine is that the owners are not personally liable, except to the extent of the fund pledged which has come into their hands. If the ship or cargo be lost, not by the enumerated perils of the sea, but by the fraud or fault of the borrower or master, the hypothecation bond is forfeited, and must be paid.

The risks assumed by the lender are usually such as are enumerated in the ordinary policies of marine insurance. If the ship be wholly lost in consequence of these risks, the lender, as before stated, loses his money.

It is usual in *B.* bonds to provide that, in case of damage to the ship (not amounting to a total loss) by any of the enumerated perils, the lender shall bear his proportion of the loss, viz., an amount which will bear the same proportion to the whole damage that the amount lent bears to the whole value of the vessel prior to the damage. Unless the bond contains an express stipulation to that effect, the lender is not entitled to take possession of the ship pledged, even when the debt becomes due; but he may enforce payment of the debt by a proceeding *in rem* against the ship; under which she may be arrested, and, in pursuance of a decree of the court, ultimately sold for the payment of the amount due. And this is the ordinary and appropriate remedy of the lender upon *B.*

Boucaut, the French name for a large cask or hogshead.

Bouches-a-feu, the French term for cannon or artillery; guns of all kinds.

Bouchon, the French name for a stopple or cork.

Bought on Time, said of a purchase to be paid at a stipulated time, as 1, 3, or 6 months. — *Bought to arrive*, applied to a purchase of goods on the sea, to be delivered on their arrival. — *Bought up*, said of any article of merchandise or produce, when a speculator buys up and clears the market of the article.

Bougie, a surgical slender, flexible tube, intended for introduction into passages obstructed by stricture or other disease. — The French name for a wax candle.

Boulanger, a baker in France; one who makes or sells bread.

Bounty, a premium or bonus paid by a government for encouraging some special pursuit; or to the producers, exporters, or importers of certain articles; or to those who employ ships in certain trades — as the *B.* granted to vessels engaged in the cod and mackerel fisheries. See DRAWBACK.

Bounty-Boats, the boats engaged in fishing for cod off the coasts of Maine and Massachusetts.

Bouquet, [Fr.] a nosegay or a bunch of flowers; an agreeable flavor or perfume; the pleasant perfume and etheric flavor of choice wine.

Bourbon, an island in the Indian Ocean, forming a French colony. It lies about 90 m. S. W. from Mauritius, and 440 m. E. from Madagascar. *Area*, 895 sq. m. *Pop.* 209,688. The chief port and town is St. Denis, situated on the N. side, in lat. 20° 51′ 43″ S., lon. 55° 30′ 16″ E. *Pop.* 20,000. It possesses no close harbor, but only an open and dangerous roadstead. A great part of the interior is a volcanic desert; but the districts on the coast are generally fertile. The climate, though humid, is pleasant and salubrious; hurricanes are, however, frequent and violent. The staple products for exportation are sugar, coffee, and cloves. Its principal commercial intercourse is with France.

Bourbon Whiskey. See WHISKEY.

Bourgeois, in printing, an intermediate-sized type between brevier and long primer, 102 lines occupying about a foot.

Bourse, the name given in France, and some other parts of Europe, to the money-market or stock-exchange, where the merchants, bankers, and *agents de change* meet to transact business.

Bourza. See BEET.

Boussole, a French marine compass.

Bovello, a Persian coin, worth about $3.62.

Bow, a bent piece of wood used for archery, made of lancewood or yew. — The sharp or rounded front part of a vessel. — A stick of an elastic wood, having elongated horsehairs stretched to a certain degree of tension along it for setting the strings of a violin or bass-viol in motion.

Bowed-Cotton, another name in Liverpool for Upland cotton.

Bower-Anchor, a working anchor, one to which the cable is bent; the most effective and reliable anchor of a ship.

Bowie-Knife, a large sharp knife, formerly often used as a dagger or offensive weapon in some parts of the U. States.

Bowline-Knot, a kind of fastening which forms a loop on a rope that will not slip.

Bowls, smooth, round, heavy, wooden balls, used for playing on a bowling-green.

Bow-Strings. See CATGUT.

Box, a receptacle of any kind, large or small, made of various materials, wood, paper, tin, mill-board, etc. Thus there are tea-chests, trunks, packing-cases, snuff-boxes, pill-boxes, lucifer match-boxes, etc. — A division of a printer's letter-case.

Box-Coat, in England, a thick overcoat for driving, sometimes with heavy capes to carry off the rain.

Box-Iron, a laundress's smoothing-iron, containing a heater in a case, differing in this respect from a flat-iron, which is itself heated.

Box-Sugar, the sugar known as clayed sugar, advanced beyond the muscavado, imported from Cuba in boxes containing about 450 lbs. These boxes, charged at from $2.75 to $3.25, are made of pine shooks, and shipped from New York to Cuba, where they cost only from $1 to $1.25.

Box-Wood, [Dutch *palmhout;* Fr. *buis;* Ger. *buchsbaumholz;* It. *bosso, bossolo,*] the very valuable wood of the box-tree, *Buxus sempervirens,*

common in the south of Europe and west of Asia. It is of a yellowish color, close-grained, very hard, and heavy; it cuts better than any other wood, is susceptible of a very fine polish, and is very durable. In consequence, it is much used by turners, and mathematical and musical instrument makers. It is too heavy for furniture. It is the only wood used by the engravers of wood-cuts for books; and provided due care be exercised, the number of impressions that may be taken from a box-wood cut is very great. In France, box-wood is extensively used for combs, button-moulds, etc.; and sometimes, it has been said, as a substitute for hops in the manuf. of beer. It is chiefly imported from Constantinople and Spain, and is sold by the pound. *Imp.* free. The American box-wood is the timber of the dog-wood tree, *Cornus florida*. It is also used by turners and wood-cutters, but does not replace advantageously the true box-wood.

Boyn, a cheese-vat.

Braca, a name for the fathom in Portugal; the land *B.* is about 2·39 yards, but the marine *B.* is only 1·80 yards.

Brace, a carpenter's tool for drilling and boring. — A rope attached to the yard of a ship for moving it. — A support or strengthener.

Bracelet, a lady's armlet of metal, ornamented shell, beads, etc.

Braces, articles of male attire worn across the shoulders to suspend the trousers.

Bracket, a curved or angular wooden or iron stay or support for shelves.

Bradoon, Bridoon, a kind of bit for horses.

Brads, small thin nails, with a very slight head, or a head projecting on one side. They are extensively manuf. at South Abington, Massachusetts.

Brahmin's Beads, a name given in India to the spherical corrugated seeds of species of *Elæocarpus*, which are used by the Brahmin priests; they are also made into necklaces, bracelets, etc., which are much admired, and fetch a high price when capped with silver.

Braid, a narrow plaited, twisted, or woven trimming, used to ornament garments.

Braid-Comb, a lady's back-comb for the hair.

Brails, ropes attached to the foot or lower corner of ships' sails, for hauling them up to the yards to facilitate furling them.

Brake, a machine attached to the wheels of heavy carriages and railroad-cars, which, when pressed against the wheels, retards or stops their motion by friction. There are numberless patents for machines or inventions for this purpose.

Bran, is the husk of ground wheat. Pure meal or flour has the bran entirely removed by the processes carried on in the flour-mill; but "seconds" or inferior qualities are a mixture of the two, especially exemplified in what is known as *brown bread*. *B.* is also used in dyeing and calico-printing; as a food for cattle and horses, etc.

Branch, the metal piece screwed on to the end of the hose of a fire-engine, carrying the jet at its termination.

Brand, an indelible mark made with a hot iron, called branding-iron, on a cask or case. The internal revenue law on official *B.*, stamps, or marks, is given under the head Stamps.—A written, printed, or engraved trade-mark. See Trade-Mark.

Brandy, [Fr. *eau de vie;* Ger. *brandewein;* It. *aquarzente;* Port. *aguardente;* Sp. *aguardiente,*] a spirituous and inflammable liquid, obtained by distillation from wine, and from the *marc*, or fermented residue of pressed grapes. Wines of all descriptions, but chiefly those that are strong and harsh (*poussés*), are used in the manufacture of *B.*—red wine for quantity, white for quality. The superior vintages, and those that have most flavor, make the worst *B.* Mark *B.* possesses a more acrid flavor than that obtained from wine. The quality of *B.* is of course dependent both on the material from which it is procured and the skill with which it is manufactured. It is naturally clear and colorless. The different shades of color which it has in commerce arise partly from the casks in which it is kept, but chiefly from the burnt sugar, saunders wood, and other coloring matter intentionally added to it by the dealers. It is said that the burnt sugar gives mellowness to the flavor of the liquor, and renders it more palatable. *B.* improves considerably with age in casks, but not in corked bottles. It is prepared in most of the wine countries of Europe; but the superiority of French *B.* is universally admitted. The latter is principally distilled at Bordeaux, Rochelle, Cognac, and in Poitou, Touraine, Anjou, Armagnac, and Languedoc. That of Cognac is in the highest estimation. *B.* from grapes is also distilled in considerable quantities in the U. States, chiefly in California, Illinois, Indiana, Missouri, and Ohio. American *B.* does not rival French *B.*, but its manufacture is rapidly improving in quality, chiefly in California. In 1878 the Internal Revenue tax was paid on 20,457,770 gallons, and 5,748 gallons were exported. The *B.* imported from France is known in the U. States as *Cognac* and *Rochelle*, and its market value depends less on its quality than on the popularity of the brand. This custom acts unfavorably on the importation of the finer brandies, as growers feel that superior quality cannot overcome the prejudice in favor of an established name, and consequently ship their finest products to markets where they will be judged on their merits. The French value of the new *B.* of commerce varies from 4 to 20 francs per gallon. *Imp.* duty — as alcohol. *Internal Revenue* tax on domestic *B.* made from grapes — as that upon other distilled spirits. See Spirits.

Brass, [Fr. *cuivre jaune;* Ger. *messing;* It. *ottone;* Sp. *laton, azofar,*] one of the most useful of all the factitious metals, is an alloy of copper and zinc in certain proportions. It is sometimes prepared by cementation of calamine, a native carbonate of zinc, with granulated copper; but more usually by combining the copper directly with metallic zinc in the proportions requisite for each particular kind of *B.* It is of a fine yellow color, susceptible of a high polish, and is little liable to rust. Sp. gr. 7·8 to 8·4. It is more fusible, sonorous, a worse conductor of heat, and harder than copper. *B.* is malleable when cold, unless the proportion of zinc be excessive; but when heated it becomes brittle. It may be readily turned upon the lathe; and, indeed, works more kindly than any other metal. There is a vast variety in the proportions of the different species of *B.* used in commerce; nor is it easy to determine whether the perfection of this alloy depends on any certain proportions of the two metals. In general, the extremes of the highest and lowest proportions of zinc are from 12 to 33 parts in the 100. The ductility of *B.* is not injured when the proportion of zinc is highest. This metal is much used in the escape-

ment-wheels and other nicer parts of watch-making; and bars of *B.*, very carefully made, command for this purpose a high price. The use of *B.* is of very considerable antiquity. Most of the ancient genuine relics are composed of various mixtures of *B.* with tin and other metals, and are rather to be denominated bronzes. The best proportion for *B.* guns is said to be 1,000 lbs. of copper, 990 lbs. of tin, and 600 lbs. of *B.*, in 11 or 12 cwt. of metal. The best *B.* guns are made of malleable metal, not of pure copper and zinc alone; but worse metals are used to make it run closer and sounder. as lead and pot-metal. The economical use of *B.* is very large. It is employed for a great variety of mechanical purposes, and in the fine arts, no metal having been found so available for these uses. It would be impossible in the compass of this article to refer to all the ends which this important metal fulfils. There are various kinds of *B.* known as pinchbeck, prince's metal, bath metal, red brass, Dutch gold, Muntz's yellow metal, and malleable brass; the difference depending on the various proportions of copper and zinc.

B. is sold in pigs, in sheets, in bars, and in wire. It is manuf. on a very large scale in Connecticut; also in Massachusetts, New York, Philadelphia, etc. In 1878 the U. States exports of *B.* (and manuf. of) amounted to $589,451, while the imports of the same were only $245,670. *Imp.* duty (in bars or pigs), 15 per cent.; in sheets, wire cloth, and *B.* manuf., 35 per cent.

Brasseur, the French name for a brewer.

Brass Foil. See DUTCH GOLD LEAF.

Brass-Founder, one who casts brass.

Brass-Rule, lengths of thin metal used by printers for cutting into sizes to separate advertisements and newspaper columns; also for page-rules and table-work in book-printing, etc.

Brass-Wire. See WIRE.

Brauvin, a spirit distilled in Sweden.

Brawn, the flesh of the hog, boned, rolled or collared, and sold fresh or pickled.

Brayer, a printer's wooden rubber, for spreading or diffusing ink on the block, now superseded by the inking-roller.

Brazier, one who works in brass and tin, etc.

Brazil, [Port. *Imperio do Brazil*,] a great country of South America, occupying nearly one-half of that continent, extending from lat. 4° 23′ N. to 33° 44′ S., and lon. 34° 40′ to 73° 15′ W. Its boundaries are: on the N. the United States of Colombia, Venezuela, and Guiana; N. E. and E., the Atlantic Ocean; and S. and W., Uruguay, Paraguay, the Argentine Confederation, Bolivia, Peru, and Ecuador. The government is a constitutional monarchy; the executive is vested in the monarch or emperor; the legislative body consists of a Senate chosen by the emperor, and a Chamber of Deputies elected by the people. The pop. of *B.* is made up of an agglomeration of many races. While *B.* remained a colony of Portugal, but few women accompanied the emigrants to S. America. The earliest settlers intermarried and mixed with Indian women; and afterwards an extensive intermixture of races occurred with the Africans who were brought for slavery. In the northern provinces the Indian element preponderates, while in Pernambuco, Bahia, Rio de Janeiro, and Minas the negroes are numerous. At the seaports, the chief part of the pop. is of European descent. Cap., Rio de Janeiro. A steamer of the *U. S. and Brazil Mail S. S. Line* sails on the 5th of every month from New York, calling at St. Thomas, Pará, Pernambuco, Bahia and Rio de Janeiro. The rates of passage (cabin) are: from New York to St. Thomas, $75; to Pará, $130; to Pernambuco, $150; to Bahia, $160, and to Rio de Janeiro, $175. The subjoined table gives the area and pop. of each of the 20 provinces of the empire, according to the official returns of the partial census of 1872, the 11 provinces in which actual enumeration was made being marked by an asterisk (*), with the number of pop. of the other 9 provinces filled in after government estimates:

Provinces.	Area.	Pop.
Amazonas (*)	753,439	57,610
Pará	412,441	280,000
Maranhão	141,645	380,000
Piauhy	81,776	219,000
Ceará (*)	50,260	721,686
Rio Grande do Norte (*)	20,129	233,979
Parahyba	20,341	365,000
Pernambuco (*)	46,255	841,539
Alagôas (*)	11,641	348,009
Sergipe	12,038	280,000
Bahia	204,794	1,450,000
Espirito Santo (*)	17,029	82,137
Rio de Janeiro	18,489	1,050,000
Santa Catharina (*)	18,923	159,802
Rio Grande do Sul	110,211	455,000
Minas Geraes	237,472	1,500,000
Matto Grosso (*)	668,625	60,417
Goyaz (*)	263,362	160,395
Paraná (*)	108,556	126,722
San Paulo (*)	90,537	837,334
Total	3,287,964	9,448,233
Wandering pop. of aborigines, about	....	1,000,000

B. has a coast-line of nearly 4,000 m., extremely varied in its aspect and formation. About one-half of the Brazilian territory is covered by highlands and mountains; but all of those are of insignificant proportions and elevation. Indeed, many rising grounds mapped and described as *serras* have nothing of a mountainous character. The Amazon and Paraguay water-shed in the province of Matto Grosso, forming the W. limit of the Brazilian highlands, is simply a low swelling plateau on which the Tapajos, Xingú, Paraguay, and other rivers have their sources; and these are so near to each other, and the water-shed is so low, that canoes ascend the Tapajos from Santarem near its confluence with the Amazon, cross over, and descend the Paraguay to Villa Maria. The principal rivers are the Amazon, with its great affluents the Madeira, Tapajos, Xingú, Negro, the Tocantins or Pará, the Maranhão, the São Francisco, the Rio Grande do Sul, etc., along with the upper streams of the Paraná, Paraguay, and Uruguay. Nearly all the geological formations are represented in *B.*, and the mineral wealth of the country includes gold, silver, diamonds, and other precious stones, iron, and coal. This is the richest diamond-producing country in the world; the most noted mines are those of the Serra do Frio, and in 1852 other very wealthy deposits were found in the prov. Minas Geraes. The climate of *B.* varies, according to the local conditions of so extensive a country; in the plains it is hot but healthy, most of the European diseases being unknown, and yellow fever comparatively a stranger. The fertility of the soil is not surpassed by that of any other country in the world; but comparatively little attention is paid to agriculture, and the growth of vegetation is in many places so rank as seriously to impede the operations of husbandry. The soil of *B.* is as varied as its climate, being in some parts amazingly fertile, and bearing almost every known species of vegetable production; while in others it is dry, arid, and unfavorable to vegetation. As a rule, the lands surrounding the large and populous cities are exceedingly rich and productive. The immense plains of the interior are for the most part covered with primeval forests, offering inexhaustible quantities of timber adapted both for solid construction and for cabinet and ornamental works. The northern provs. produce cotton, sugar, rice, tobacco, tapioca, isinglass, caoutchouc, indigo, cacao, and a variety of drugs and dye-woods; the middle provs. coffee, sugar, tobacco, rosewood, rice, etc.; while in the southern prov. of Rio Grande, the hides and horns of the wild cattle form the chief source of wealth. A small quantity of wheat is raised in Rio Grande, which, in point of soil and climate is so well adapted for the productions of the temperate zone that it might not only supply all the rest of the empire with provisions, but have a considerable surplus for exportation to foreign countries. The Mandioca plant is common nearly all over the empire; the root ground into meal, forming a general article of food, while the plant itself produces tapioca, which

is largely exported. Indian corn, millet, and beans are also generally cultivated. Cotton is raised chiefly from lat. 15° S. to the equator; the best is that of Pernambuco; next, that of Maranham; that of Bahia and Pará is inferior. Sugar is cultivated chiefly in the prov. of Bahia, but to a great extent likewise in the provs. of Rio de Janeiro and Pernambuco. Coffee forms the chief object of culture in the prov. of Rio de Janeiro, and adjacent provinces. Four-fifths of the coffee consumed in the U. States, and over half of all that is used in the world, is of Brazilian growth. Each tree is supposed to yield annually, on an average, two pounds of coffee; but some give as much as eight. Besides the provinces adjacent to Rio de Janeiro, the coffee plant flourishes in the shade of the Amazon forest, and with moderate care yields two annual crops; and the Ceará coffee, much esteemed, grows on the mountain slopes, at an elevation of from 2,000 to 3,000 feet above the sea. In the prov. of Pará, the coffee plant is seen growing on almost every roadside, thicket, or waste. The vine and the olive are cultivated to a limited extent in the southern provinces. — Sugar refining is carried on extensively, particularly in the great cane-growing provinces of Bahia and Pernambuco, where there are numbers of *engenhos* established on a grand scale, with the best modern machinery for water- or steam-power. Tobacco and cigars of a common class (*charutos*) are manufactured on a large scale in Bahia, Rio de Janeiro, and other places. A number of cotton-weaving factories have been established, and compete favorably with foreign manuf. in the production of the coarser fabrics. Very good silks are made at Rio de Janeiro and elsewhere. There are also manufs. of common and wall papers, soap, chemicals, braids, ribbons, bronzes, etc.—The principal exports from *B.*, besides coffee, are cotton, sugar, cacao, hides, horns, tobacco, diamonds, India-rubber, etc. The principal imports are cotton and woollen fabrics, and wrought and unwrought iron from England; wines from Portugal, Spain, and France; cotton fabrics, agricultural implements, hardware, lard, flour, petroleum, biscuits, coal, ice, hams, boots and shoes, etc., from the U. States. The total value of the imports into *B.*, in the five years from 1874 to 1878, averaged $100,000,000, and the exports $150,000,000. About one-third of the total imports come from Great Britain, nearly one-fourth from France, and the rest chiefly from the U. States, Argentine Confederation, Portugal, and Germany. About one-fourth of the exports go to Great Britain, above one-fourth to the U. States, the remainder being divided chiefly among France, the Argentine Confederation, Germany, and Portugal.

Commerce of the United States with Brazil from 1869 to 1878.

Years.	Exports to *B.*	Imports from *B.*	Total Imp. and Ex.
1869	$6,069,079	$24,912,450	$30,981,529
1870	5,817,846	25,175,959	30,993,805
1871	6,089,154	30,560,648	36,649,802
1872	5,985,924	30,134,249	36,120,173
1873	7,199,922	38,558,028	45,757,950
1874	7,705,820	43,911,315	51,617,135
1875	7,745,359	42,033,046	49,778,405
1876	7,347,380	45,453,173	52,800,553
1877	7,582,813	43,498,041	51,080,854
1878	8,686,704	42,972,036	51,658,740
Total	$70,230,001	$367,208,945	$437,438,946

The total imports and exports for 1878, representing 4·50 per cent. of the general foreign commerce of the U. States

The principal articles exported to and imported from the U. States in 1878 were as follows: *Exports:* Medical books, $196,786; chemicals, dyes, etc., $56,615; cocoa, $23,415; coffee, $35,367,992; hair, $34,309; hides, $1,288,085; India-rubber, $2,457,398; wood, $88,061; fruits, $27,643; brown sugar, $3,165,384; wool, $97,127.—*Imports:* Agricultural implements, $23,420; beer, $9,825; blacking, $6,528; books, etc., $8,265; biscuit and crackers, $37,799; Indian corn, $106,881; wheat, $75,000; wheat flour, $4,436,006; tallow, $5,922; carriages, etc., $15,210; railroad cars, $340,458; clocks, $22,436; coal, $5,658; cotton (manuf.), $523,332; drugs, etc., $104,889; apples, $11,400; glass and glassware, $42,038; jewelry, $11,026; railroad rails, $95,020; car-wheels, $10,171; steam-engine locomotives, $296,173; machinery, $139,055; nails, $10,006; other manuf. of iron, $123,205; edge-tools, $102,680; lamps, $11,149; boots and shoes, $11,816; rosin and turpentine, $49,972; petroleum, $655,797; paper and stationery, $49,024; perfumery, $28,569; printing-presses, $11,239; lard, $604,999; sewing-machines, $21,814; soap, $27,131; wood (boards, deals, joists, staves, etc.), $191,507; household furniture, $82,974.—The customs duties upon all articles manuf. in the U. States are very heavy, averaging from 40 to 50 per cent.

In 1878, 161 American vessels (tonnage 60,002), 3 American steamers (tonnage 5,845), 371 foreign vessels, and 44 foreign steamers, engaged in the Brazilian trade, entered the American ports; and 216 American vessels (tonnage 79,997), 8 American steamers (tonnage 10,673), 149 foreign vessels (tonnage 45,210), and 8 foreign steamers (tonnage 7,527), cleared the American ports for Brazil.

Considerations on the Trade of the U. States with B.—We owe the following and most valuable information to Mr. Thomas Adamson, U. S. Consul-General at Rio de Janeiro. "If our merchants wish to sell goods in *B.*, they should establish houses, learn the language of the country, acquaint themselves with the fancies and needs of the people, and import the kind of goods required here. There is business in the country on which many people have grown rich. We may have a full share of it if we work for it. One of the ways *not* to succeed is to make trial shipments, often consigning the goods to a house that deals in articles of an entirely different kind. This consular office is in very frequent receipt of letters requesting the name of some person or firm who deals in a certain line of goods, with a view to sending a consignment. John Smith writes to say he manufactures pocket-books, and wants to know the address of a dealer in the article. He is informed that Fulano & Co. are large dealers in such goods. He ships a case or two of his goods to Fulano & Co., who have on hand a large stock which they purchased, and they sell their own goods first. The shipper gets uneasy, urges speedy sales, the goods are sent to auction and the owner gets very small returns. One of the serious drawbacks to an extension of American trade in *B.* is the system of long credits which prevails, a system less injurious to the European than to the American merchant, because of the lower rate of interest on capital in the money markets of Europe. This system compels the importing merchant to do a kind of banking business in connection with his regular business, and obliges him to carry large amounts in non-negotiable paper, running from one to twelve months, with the privilege of extension at the will of the debtor. In Rio de Janeiro it is no unusual case for a commercial house to have from $250,000 to $500,000 constantly outstanding in such paper. Few American merchants would care to risk such long credits, especially when they consider the fluctuations in exchange and the small margin between the rate of interest which their money will command in *B.* and at home. At the present moment the credit system has so undermined the business of the empire that a commercial crisis might very easily be precipitated. Beginning with the importer, this pernicious system extends to the smallest consumer, and so great has become the sum of outstanding credits that any sudden measure of reform, even of limited extent, could not fail to produce wide-spread distress, if not bankruptcy. It becomes therefore a question of importance to the American merchant whether he shall invest his capital largely in this country, entering into competition with the old houses on their own ground, or whether he shall be content with a less ambitious but much safer beginning, and steer clear of the great dangers which now beset his trade. It is certain that there is a considerable market in *B.* for many lines of American manufactures, and that a demand may be created for other goods, as yet novelties here, but the unfavorable state of business renders it advisable to limit all enterprises to a cash basis. This will, of necessity, prevent the rapid growth of our trade for a time, and until sounder methods of business have placed us on an even footing with our competitors.

"In view of the fact that the empire of *B.* produces but a small portion of many principal articles of food consumed by its people; that not only the products of other climates, but also those things produced within her own borders, such as rice, corn, and meats, enter largely into the list of her staple imports, the trade in food substances deserves the attention of our merchants who seek to establish business relations with the empire. Each prov. has some great source or sources of wealth, to the production of which everything is made subordinate. In the S. provinces these are animal products, hides, beef, horns, hair, etc. In San Paulo and Rio Janeiro, it is coffee; in Bahia, tobacco; in Pernambuco, sugar and cotton; in Pará, India-rubber, cacao, and Brazil-nuts. Everything else is discarded or neglected. While potatoes, rice, beans, onions, etc., may be easily produced, they are almost wholly imported from France, England, and Portugal. Indian corn, which grows well in the uplands, comes mainly from the U. States; and the principal meat food of the whole empire, jerked beef, which is so easily produced in the S. provinces, is imported from Uruguay and Buenos Ayres to the extent of fourteen-fifteenths of the whole consumption. Whether the state of affairs is favorable to the prosperity of *B.* is not a question within the scope of this article. It is sufficient for the merchant to know that it is favorable to a certain line of commercial enterprise.

"Those who intend to engage in this branch of trade should first make a careful study of the methods employed by our competitors in preparing and packing their goods for S. American markets. The *labels*, *covers*, and *capsules* on cans, jars, and packages of fruits, vegetables, oysters, etc., are important factors in all efforts to introduce these goods into the Brazilian market. Good taste should be displayed in all things. The Brazilians are great admirers of France, and are largely influenced by the preferences and prejudices of the French people. The means employed in the U. States are frequently insufficient for *B.* In this hot, moist climate, our ordinary food preparations spoil very quickly, and for that reason the greatest care is necessary both in preparation and packing.

"The greater part of the *flour* consumed in *B.* comes from the U. States, and for fifty years past it has been our chief article of export to that country. Our competitors are Austria and Uruguay, both of whom are slowly gaining at our expense. The Austrian flour is highly esteemed and commands about a dollar a barrel more than American. It is packed in smaller and stronger barrels than ours, but containing the same weight. Of American flour, Richmond brands are preferred in this market. Of late there has been much complaint of the bad condition in which American flour arrives. The barrels are said not to be as strong as formerly. To retain our past supremacy in this trade, the quality of the flour must be kept up to an uniformly high standard and more care exercised in packing and shipping.

"*Lard* comes almost wholly from the U. States, there being no competition worthy of mention. Great care should always be observed with its packing, so as to command the paying price.

"There is but a limited demand for *salted meats* here, and that principally among the shipping. In 1877 only 80 barrels were imported from the U. States.

"Thus far the American *cured ham* has had a very unfortunate reputation in this market. In nearly every case they have proved inferior to the English ham in quality, and therefore sell at a much lower price. They also lack keeping qualities in many cases, spoiling before they can be placed on the market. The English ham is preferred at a cost from 10 to 15 cents per pound over the American. The surfaces are carefully cleaned or pared, chaff is placed inside the canvas covering, and they are carefully packed in coarse dry salt in boxes or barrels. As it is a question of preparation, not of price, our shippers must make the necessary improvement in curing and packing before they can hope for success here. *Dried meats* of the finer kind are imported from Portugal, Italy, and France. *Jerked beef*, or 'carne secca,' as it is called here, comes almost entirely from the River Platte and Uruguay. During 1877 the receipts of that article at Rio de Janeiro were 33,294,400 kiloo, or 73,401,533 pounds, of which only one-fifteenth were Brazilian. *Preserved meats*, in tin cans, are imported in moderate quantities from Great Britain and France, and are used almost exclusively by foreigners, or in small quantities by rich Brazilians. A limited quantity of American pressed corned beef is sold here.

"Of *fish*, dried, salted, or preserved by cooking in tin cans, excluding codfish, there were imported, in 1877, 30 kegs from the U. States; 5,834 boxes and kegs from France; 5,247 boxes and kegs from Portugal, and 314 packages from other countries. The greater part of codfish imported comes from British North America. The receipts during 1877 were 64,385 packages, of which 3,284 packages came from the U. States. There is considerable sale for Oregon salmon, and I believe there is a good opening for the sale of lake trout and white fish if properly pushed. It is said that much of the salmon sold in Brazil as British is really American, with the labels changed. American *oysters* are a staple article and command fair prices. This trade is capable of considerable expansion, and should be carried on directly between the two countries. If shippers would send really good goods and maintain a certain standard, there is every reason to believe a good business may be made." —(*Am. Mail and Export Journal, March*, 1879.)

Seaports. *B.* has 42 seaports, the principal of which, in their order from N. to S., are those of Pará, Maranhão, Parahyba, Pernambuco, Maceió, Aracajú, Bahia, Lhéos, Santa Cruz, Porto-Seguro, Victoria, Rio de Janeiro, Santos, Paranaguá, Santa-Catharina, and Rio-Grande-de-Sul. The most important of these are the following:

Pará, or *Belem*, cap. of prov. of Pará, is situated in lat. 1° 30′ S., lon. 48° 22′ 33″ W., on the river Amazon, about 75 m. from its mouth, and 300 m. W. N. W. of Maranhão. It is one of the finest of Brazilian cities. The harbor is confined, and is said to be diminishing in depth; the approach from the ocean is also rather difficult, and it is always expedient to take on board a pilot at the mouth of the river. It is the chief shipping-port for the India-rubber, immense quantities of which are collected on the shores of the Amazon. The other principal articles of export are sugar, hides, sarsaparilla, annotto, and Brazil-nuts. *Pop.* 35,000.

Maranhão, or *São Luis*, is in lat. 2° 31′ S., and lon. 44° 19′ W. It lies on the island of that name, forming the S. E. side of the bay of Marcos. The harbor is good and safe, but the entrance is difficult. *Pop.* 45,180.

Pernambuco, or *Recife*, in lat. 8° 3′ S., and lon. 34° 52′ W., is the cap. of the prov. Pernambuco, and one of the most flourishing ports of *B.* It comprises 3 different towns, which are built on sand-banks surrounded by the sea, and connected by bridges. Exports cotton, sugar, tobacco, hides, etc. *Pop.* 116,672.

Bahia, or *São Salvador*, is situated in lat. 13° 1′ S., and lon. 38° 32′ W., on the capacious bay of All Saints (Bahia de Todos-os-Santos), 740 m. N. N. E. of Rio de Janeiro. It is the cap. of the prov. Bahia, and the second city and seaport of the empire, in importance and population. It has an excellent harbor, which receives vessels of the largest tonnage. It exports more sugar and tobacco than all the rest of *B.* *Pop.* 129,109.

Rio de Janeiro, or simply *Rio*, the cap. of the empire, and one of the most magnificent cities of the two continents of America, is situated on the W. side of one of the finest bays in the world, 80 m. W. of Cape Frio, in lat. 22° 54′ S., lon. 43° 7′ 15″ W. To the right on entering the bay is the fort of Santa Cruz, within hail of which all vessels going into the harbor are required to pass, in order to answer any questions that may be put to them. The harbor is one of the finest known, and indeed can scarcely be excelled for capaciousness, and the security which it affords to vessels of every description. The entrance into it from the sea does not exceed a mile from point to point, but widens afterwards to about 3 or 4 miles. Rio de Janeiro is the seat of more than one-half of the foreign commerce of *B.*, and it has likewise a very extensive inland trade, particularly with the prov. of Minas Geraes, Goyaz, and Matto Grosso. It is the key to the mining districts—furnishing all their supplies, and receiving all their produce for shipment or other disposal. It is the greatest mart for coffee in the world. *Pop.* 274,972.

Santos is in lat. 23° 55′ S., lon. 46° 19′ W., on the N. of the island of Engua Guaça. The port is large and commodious, and it has an active trade in sugar. *Pop.* 15,000.

Railroads and Telegraphs. *B.* possessed, in 1878, railroads of a total length of 1,438 m., opened for traffic. The principal lines are—the Pedro Segundo, 138 m.; the San Paulo, 85 m.; the Bahia, 75 m.; the Pernambuco, 76 m.; the Cantagalia, 21 m.; and the Mauá, 15 m. There were railroads of an aggregate length of 800 m. in course of construction at the same date. A commencement has been made to establish a system of telegraphs. There were, in 1878, lines to the extent of 3,890 m.

Finances. In the budget for 1877, both the revenue and expenditure were calculated at 105,378,914 milreis, or $51,689,455. The total debt of *B.*, home and foreign, amounted in 1878 to $367,904,450. The annual charge of the State for sinking fund and interest was $19,963,165, being more than a third of the national revenue. The whole of the foreign loans of *B.*, $95,467,500, bearing 5 per cent. interest, were contracted through the banking-house of Rothschild & Co., and on the security of "all the resources of the empire." The internal debt, $72,436,950, is chiefly represented by bonds, called *Apolices*, inscribed to the holder, and the payment of its cap. and interest, which is provided for by an annual vote of Congress, is under the charge of the sinking-fund department (*Caixa da Amortisacao*), independent of the government. *B.* has besides a floating debt, estimated at $255,000,000, consisting in great part of treasury bills.

Banks in Rio de Janeiro. The *Banco-do-Brazil*, founded in 1853 with a cap. of $18,744,014, had the exclusive right to issue notes payable to bearer. This right was cancelled in 1866, with obligation to pay its notes in 20 years, at the rate of 5 per cent. per year, which rate was reduced in 1873 at 2½ per cent. — *Banco-Commercial-do-Rio-de-Janeiro*, founded in 1866 to receive deposits and make discounts. Cap. $6,800,000, on which $1,173,600 are paid. — *Banco Nacional*, founded in 1871. Cap. $5,600,000, all paid. Deposits and discounts. — *Banco-Industrial-e-Mercantil*, authorized in 1872. Cap. $11,200,000, on which $2,840,000 are paid. Deposits, discounts, and credit. — *English-Bank-of-Rio-de-Janeiro*, has branches at Pernambuco and Santos. Cap. £4,000,000, on which £2,000,000 are paid. There are many other banks and institutions of credit.

Money. The *Milreis* or 1,000 Reis = $0·52. The standard of value is the gold *Octava* of 22 carats, equal to 4 milreis. Gold and silver coins have almost disappeared in recent years in *B.*, and the only circulating medium is an inconvertible paper currency, consisting of treasury notes, called *sedulas* of a milreis and upwards, depreciated in value — specie bearing a premium of 60 to 75 per cent. — together with copper and bronze coins.

Weights and Measures. The French metric system, which became compulsory in 1872, was adopted in 1862, and has been used since in all official departments. But the ancient weights and measures are still partially employed. They are:

The *Libra* = 1·012 lbs. avoirdupois.
The *Arroba* = 32·38 " "
The *Quintal* = 129·54 " "
The *Alquiere* (of Rio) = 1 bushel.
The *Oitava* = 55·34 grains.

Besides the above, the weights and measures of Portugal are also in use in some parts of the empire.

Brazilctto Wood, is the wood of a small tree, *Cæsalpinia Brasiliensis*, which is much used for ornamental cabinet-work, and is peculiarly adapted for carriage-wheel spokes. It was formerly used as a dye, but Brazil-wood has superseded it. *Imp.* free.

Brazilian Pebbles, lenses for spectacles, ground from pure, transparent, colorless quartz, or rock-crystal. *Imp.* free.

Brazilian Tea, a substitute for tea, prepared from the leaves of *Stachy tarpheta mutabilis*, and also of *Lantaria pseudothea.*

Brazil-Nuts, [Fr. *noix pêchurins;* Ger. *pechurinnüsse;* It. *noci gemelle;* Port. *pucharins;* Sp. *becuiba,*] the fruit of the Juvia, *Bertholletia excelsa*, a majestic tree growing to the height of 100 or 120 feet, abounding on the banks of the Orinoco, and in the northern parts of Brazil. The nuts (Fig. 43) are triangular, having a cuneiform appearance, with sutures at each of the angles; the shell is rough and hard, and of a brownish ash color. The kernel resembles that of an almond, but is larger, and tastes more like a common hazel-nut; it contains a great deal of oil that may be obtained by expression or otherwise. These nuts do not

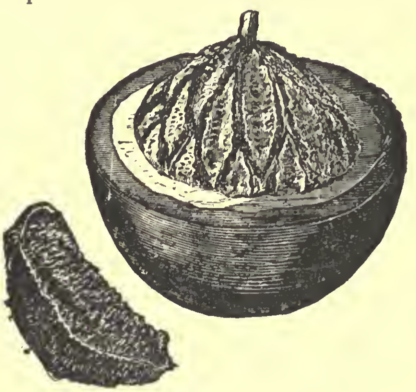


Fig. 43.—BRAZIL-NUT,
Showing fruit cut open, and a separate nut.

grow separately, or in clusters, but are contained, to the number of from 15 to 50 or more, in great ligneous pericarps or outer shells, generally of the size of a child's head. The outer shell is very hard and strong, so that it is rather difficult to get at the nuts, which are closely packed in cells inside. The natives are particularly fond of this fruit, which is also much esteemed in this country and in Europe. It is imported in considerable quantities, chiefly from Pará. *Imp.* free.

Brazil-Wood, [Fr. *bois de Brésil;* Ger. *Brasilienholz;* It. *leguo del Brasileverzino;* Port. *pao Brasil;* Sp. *madera del Bresil,*] a valuable dyewood, the product of a tree, *Cæsalpinia echinata*, which grows in various tropical countries, but is found in greatest abundance, and of the best quality, in the province of Pernambuco in *B.*, where it is known as *pao de Rainha*, or Queen's-wood. The tree commonly grows in dry places and amid rocks, and seldom exceeds thirty feet in height. The only valuable part is the heart, which, after being freed from the thick bark and white pith, is only about one-half of the bulk of the trunk. *B.* is ponderous and hard; and when first cut is of a pale red, but becomes darker by exposure to air. It is variegated with irregular black spots, has a sweetish taste when chewed, and gives out its color with water, a property by which it is distinguished from saunders-red or sandal. The thick and close-grained pieces are preferred. The wood is susceptible of a good polish, and is occasionally used by the turner and cabinet-maker, but it is chiefly employed as a red dye. It is, however, for many purposes, superseded by the aniline colors. Ground *B.* is sold in New York in bbls. of 130 lbs., at about 3½ cts. per lb. *Imp.* free.

Brazing, the operation of hard soldering brass and other metals by means of the blow-pipe.

Bread, [Fr. *pain;* Ger. *brot,*] consists of a paste or dough formed of the flour or meal of different sorts of grain mixed with water and baked. When stale dough or yeast is added to the fresh dough, to make it swell, it is said to be *leavened;* when nothing of this sort is added, it is said to be *unleavened*, and called *Loaf B.* Sea biscuit, oat cakes, barley bannocks, rye cakes, etc., are examples of unleavened *B.* *Loaf B.* is made by working the flour into *dough* or paste with water, yeast, and a little salt, allowing it to stand until a certain degree of fermentation takes place, and then baking it in an oven heated to about 488° F. During the fermentation a quantity of gas is formed, and as it is prevented from escaping by the toughness of the paste, and dilated by the heat of the oven, the *B.* is rendered light, porous, and soft. Many bakers add potatoes to the flour. This admixture neither injures the quality nor the wholesomeness of the *B.;* but adulterations which are not so innocent are sometimes had recourse to, for the purpose of concealing the taste of damaged flour or to make the *B.* white when formed of inferior flour. The use of alum is liable to this objection, as being positively injurious to health; it is employed to lighten the dough.—*Aerated B.* has no yeast or ferment in it; carbonic acid is *directly* applied, instead of resulting from fermentation. While the dough is being worked by steam-power in a strong iron globular vessel, carbonic acid is forced in. The result is, that when the loaf is baking, the gas expands, bursts in bubbles from the surface and makes the *B.* light and porous by forcing its way through the dough. Medical men give a high character to this bread for purity and salubrity, while the manufacturing processes are simple, rapid, and economical. Many forms of *B.* are baked in tins, to give definite shape to the loaves; but this does not alter the other characteristics of the *B.*—The species of *B.* in common use in a country depends partly on the taste of the inhabitants, but more on the sort of grain suitable for its soil. But the superiority of wheat and Indian corn to all other farinaceous plants in the manufacture of *B.* is so very great, that wherever they are easily and successfully cultivated they are used to the nearly total exclusion of most others. Where, however, the soil or climate is less favorable to their growth, rye, oats, etc., are used in their stead.

Bread-Fruit, the fruit of *Antocarpus incisa*, a tree of S. Asia, now naturalized in the West Indies. It is nearly spherical, is covered with a rough rind, weighs sometimes 4 pounds or more, contains a large portion of starch fecula, and is a principal part of the food of the natives of the South Sea Islands. When baked in an oven the pulp is white and mealy, very nutritive, and resembles wheaten bread.

Bread-Platter, a fancy wooden trencher for cutting bread on.

Bread-Stuffs, an American commercial term for grain and meal; the produce of food plants which enter into commerce. As used in official returns of the U. States, the word *B.* includes bread and biscuit, barley, Indian corn, Indian corn-meal, oats, rye, rye flour, wheat, wheat flour, all other small grain and pulse, farina, and all other preparations of *B.* used as food, such as arrowroot, macaroni, vermicelli, etc. The imports of *B.* in 1878 were $8,514,005, while the exports reached $181,777,841.

Break, or BRAKE, a drag put on the wheel of a coach or railroad-car to check its speed. There are many patents for *B.*, the most generally adopted on American railroads being the Westinghouse Air-break, and the Ames Vacuum-break. — The

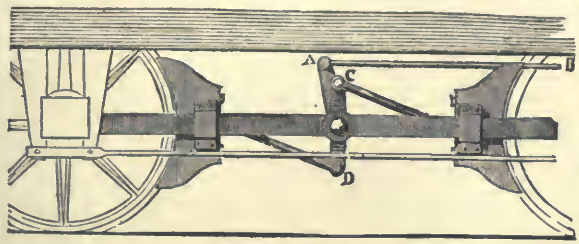


Fig. 43. — BREAK.

The accompanying figure exhibits the simplest form of *B.*, to show its action on the wheels. A B is an iron rod so disposed that it can act on the lever C D, which is mobile round the axis E. The rod A B is articulated at A to an arm of the lever fixed to that axis; and when the rod is drawn from A towards B, the two pieces of wood are pressed against the wheels by the intermediary of two iron shanks, which are articulated to the two ends of the lever C D, and to these two pieces of wood.

fly-wheel of a carriage or machine. — A substantial frame-work carriage for breaking in young horses to harness. — *To break*, to stop business for cause of insolvency, to make bankrupt.

Breakage, an allowance usually made by the shipper or seller on certain class of cheap fragile goods. Actual *B.* is allowed in the assessment of duties on importations of every kind of liquors, when the importer declares his option at the time of the entry; otherwise he is entitled to the allowance fixed by law, which is 10 per cent. on malt liquors in bottles, and 5 per cent. on all other liquors in bottles.

Breaker, a small ship's or boat's cask for holding water.

Breaker (Stone), is a machine for the breaking of stones, ores, and other hard substances into fragments of moderate size. It is used in the construction of roadways, in preparing concrete, in mining operations, and in crushing minerals for vârious purposes.

There are several machines patented for this object, among which is the *Blake Crusher* (Fig. 44), manufactured at New Haven, Conn. It is very simple in construction, but is made strong and massive on account of the great strain and wear to which its working parts are subjected in crushing minerals, some of which yield only to a pressure of over 13½ tons to the square inch. Its principal features are a heavy frame in which are set two upright jaws, one of which is usually fixed while the other has a slight vibratory movement imparted to it by a rotating shaft. These jaws are wide enough apart at the top to receive the stones to be broken, but converge towards each other below, so that at the bottom the opening is only wide enough to permit the fragments to pass when broken to the required size. It will thus be seen that when a mass of stone or ore is placed between the jaws at the top, the vibrating jaw advancing cracks it into two or more pieces; then receding, it liberates the fragments which drop lower down between the jaw-plates. It will be seen that the distance between the jaws at the bottom limits the size of the fragments. This distance, and consequently the size of the fragments, may be regulated at pleasure. A variation to the extent of ⅝ of an inch may be made by turning the screw-nut W, which raises or lowers the wedge N, and moves the toggle-block O, forward or back. Further variations may be made by substituting for the toggles G G, or either of them, others that are longer or shorter; extra toggles of different lengths being furnished for this purpose. This machine is made of different sizes, the largest being capable of taking in a stone weighing half a ton and reducing it in five seconds to fragments of five inches and downwards. The opening at the bottom of the jaws may be varied at pleasure, so that fragments of any size may be produced.

Breakfast-Cups, china or earthenware cups larger than the ordinary sized tea-cups.

Breaking-Bulk, the act of commencing to discharge a cargo. The commander of any vessel carrying the mail becomes liable to a penalty of $100 for breaking bulk before having delivered into the post-office every bag, parcel, or package of letters that were on board.

Break-Van, an empty van attached to the end of a railroad-train.

Breakwater, [Fr. *brise-lames;* Ger. *wellenbrecher*,] an artificial barrier designed to break the force of waves in seaports and harbors, and thus to protect shipping from damage; but more commonly to create a harbor or a secure anchorage where none existed before.

Bream, a fresh-water fish of the carp family, *Abramis Brama*, which is much eaten in South-eastern Europe. The sea *B.* is a species of *Pargus.*

Breaming, the act of graving or cleansing the bottom of a vessel by burning.

Breast-Plate, a piece of metal armor.

Breast-Ropes, support ropes secured in the chains of a ship for the leadsman to lean against.

Breast-Wheel, or MIDDLE-SHOT WHEEL, [Fr. *roue hydraulique de coté;* Ger. *kropfrad*,] an hydraulic motor which receives the water on the float-boards on a level with the axis (Fig. 45).

Breeches, men's garments for the lower part of the body.

Breeching, the hinder part of the harness of a horse. — The tackling of a cannon.

Breech-Loaders, are ordnance and small arms which are loaded by putting in the shot or cartridge directly at the breech, instead of inserting it

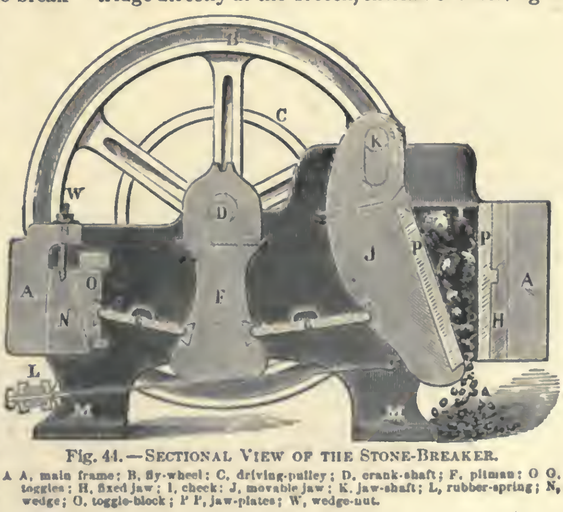


Fig. 44. — SECTIONAL VIEW OF THE STONE-BREAKER.

A A, main frame; B, fly-wheel; C, driving-pulley; D, crank-shaft; F, pitman; O O, toggles; H, fixed jaw; I, check; J, movable jaw; K, jaw-shaft; L, rubber-spring; N, wedge; O, toggle-block; P P, jaw-plates; W, wedge-nut.

at the muzzle. This kind of arm dates as far back as the reign of Henry VI., and several ancient examples of it are found in the armory of the Tower of London. Of late years, *B.* have almost wholly superseded muzzle-loading pieces, and im-

provements in this kind of arm are being made almost annually. Among the more recent heavy guns of this character are the Armstrong, Blakely, Dahlgren, Whitworth, Lancaster, and Krupp guns, and the Mitrailleuse. Among small-arms we have the Chassepot, Sharp, Snider, Spencer, Ward-Burton, Remington, Enfield, and Martini-Henry rifles, etc.

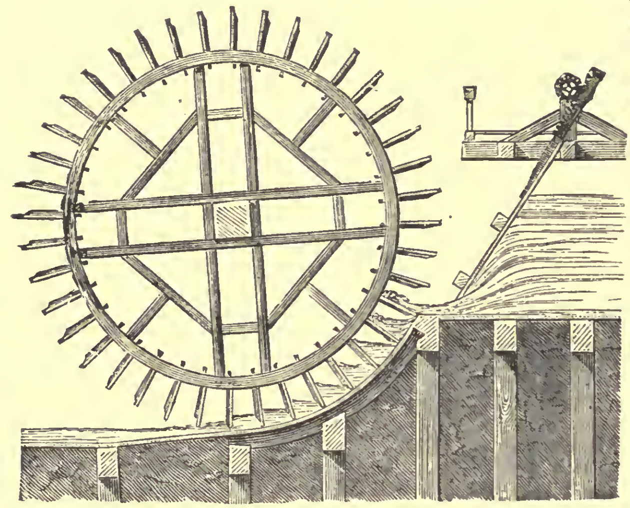


Fig. 45.—Breast-Wheel.

Breeze, the small dust-coal of the mines, used to some extent in England for making coke and artificial fuel. — Ashes and cinders sifted from dust-holes, used in brick-making.

Breluche, a French drugget or floor-cloth, a mixture of thread and worsted.

Bremen, a free city of Germany (*Freie Stadt Bremen*), situated on both banks of the Weser, about 45 m. from the North Sea and 60 m. from Hamburg, in lat. 53° 4′ N., lon. 8° 48′ E. Its situation renders *B.* the principal emporium of Hanover, Brunswick, Hesse, and other countries traversed by the Weser. *B.* was for centuries one of the chief towns of the Hanseatic League; it is governed under a constitution revised in 1854 by a Senate of 18 members (elected for life) forming the executive, and the Bürgerconvent, or the Convent of Burgesses, of 150 members, invested with the power of legislation. Area of the State, 106 sq. m. *Pop.* 142,200 (including the Prussian garrison).

The entrance to the Weser lies between the Mellum and other sands on the S. W. side and the Teglers Plaat, etc., on the N. E. side. Vessels drawing not more than 7 feet come up to the town, and those drawing 13 feet may come up to Vegesack, about 13 m. below *B.;* but large vessels do not generally ascend higher than Bremerhaven, lying on the E. bank, about 38 m. below the town, and which is Bremen's seaport. The port and shipping charges are very moderate. The principal German exports are woollen goods, linens, grain, oak bark, glass, smalts, hams, hides, rapeseed, beef and pork, rags, wool, wine, wooden toys and clocks, oil-cake, etc. The imports consist of tobacco (of which large quantities are re-exported), coffee, sugar, and other colonial products; whale-oil, iron, rice, hides, wines, raw cotton, cotton stuffs and yarn, earthenware, coal, brandy, tar, tea, dye-woods, timber, hemp, etc. The over-sea trade of *B.* with the U. States is important. She sends to America a great variety of German products, and brings back large quantities of cotton, tobacco, rice, petroleum, and other American produce. Next to that of Hamburg the port of *B.* is the chief outlet of German emigration and the largest for the international trade of Germany. The number of merchant vessels belonging to the State in 1878 was 255, of 196,011 tons, including 58 steamers, of an aggregate burthen of 57,676 tons. In the same year there arrived at the port of *B.* 2,720 vessels of 920,904 tons, and there cleared 2,799 vessels of 861,807 tons. The only expenditure of the State, nearly balanced by the revenue, is about $3,000,000. The public debt, bearing 3½ and 4½ per cent. interest, amounts to 90,385,521 marks, or $22,-596,380; it was incurred for constructing railroads, harbors, and other public works.

The *Chamber of Commerce* or *Board of Trade* consists of 24 members and two syndics elected by and from merchants. It possesses certain legislative and executive functions.

The *Bank of B.* has a cap. of $400,000 and a note circulation of about $200,000. The *Discount and Deposit Bank* has a cap. of $2,250,000, and is empowered to issue notes, payable on demand, to the amount of one-third of the bullion in its coffers. There are many other banks and institutions of credit.

Money, Measures, and Weights. See GERMANY.

The North German Lloyd Steamship Co., founded at *B.* in 1857, has a fleet of 30 large iron screw-steamers, running between *B.* and various ports in North and South America. Among these are 8 splendid steamers of 3,500 tons — the *America*, *Donau*, *Main*, *Mosel*, *Neckar*, *Oder*, *Rhein*, and *Weser*, which maintain a regular communication with New York, leaving New York every Saturday for Southampton and Bremen.

Bremen Blue and **Green**. See VERDITER.

Brest. See FRANCE.

Bretagnes, a kind of linen goods, made in lengths of 6 or 7 yards by 1 yard wide.

Brevet d'Invention, a French patent-right.

Brevier, an intermediate-sized type between bourgeois and minion; 112½ lines would be contained in a foot.

Brewer, one who manufactures fermented liquors of any name or description for sale, from malt or from any substitute therefor.

Internal Revenue Laws of the U. States (*Aug.* 8, 1878).— "There shall be paid on all beer, lager-beer, ale, porter, and other similar fermented liquors, brewed or manufactured and sold, or removed for consumption or sale, within the United States, by whatever name such liquors may be called, a tax of one dollar for every barrel containing not more than 31 gals.: at a like rate for any other quantity or for any fractional part of a barrel. — Every person who manufactures fermented liquors of any name or description for sale from malt wholly or in part, or from any substitute therefor, shall be deemed a brewer. — Every *B.* shall, before commencing or continuing business, file with the collector of the district in which he designs to carry it on a notice in writing, stating the name of the person, company, corporation, or firm, their places of residence, description of the premises, and of his or their title thereto, and the name of the owner thereof. — At the time of filing the above notice, the *B.* will pay the special tax required by law, which is $100 per annum where he manufactures 500 barrels or more per year, and fifty dollars per annum where he manufactures less than 500 bbls. per year.— "Every person who sells or offers for sale malt liquors in quantities of not less than five gallons at one time, but who does not deal in spirituous liquors, shall be regarded as a wholesale dealer in malt liquors, and shall pay a special tax of fifty dollars. — Every person who sells, or offers for sale, malt liquors in less quantities than five gallons at one time, but who does not deal in spirituous liquors, shall be regarded as a retail dealer in malt liquors, and shall pay a special tax of twenty dollars.—Every *B.* on filing notice, as aforesaid, and on the first of May in each succeeding year thereafter, shall execute a bond to the U. S. to be approved by the collector of the district, in a sum equal to twice the amount of the tax which, in the opinion of the collector, said *B.* will be liable to pay during any one month; and conditioned that he shall in all conditions faithfully comply without fraud or evasion, with all requirements of law relating to the manufacture and sale of any malt liquors aforesaid. — Every *B.* shall from day to day, enter, or cause to be entered, in a separate book to be kept by him for that purpose, the kind of malt liquors manufactured, the estimated quantity produced in barrels, and the actual quantity sold or removed for consumption or sale in barrels or fractional parts of barrels. He shall also from day to day enter in a separate book kept for that purpose, an account of all materials by him purchased for the purpose of producing such fermented liquors, including grain and malt. And he shall render to the collector on or before the tenth day of each month, a true statement, in writing, in duplicate, taken from his books, of the estimated quantity in barrels of

such malt liquors brewed, and the actual quantity sold or removed for consumption or sale during the preceding month. — The entries made in such books shall, on or before the 10th of each month, be verified by the oath of the person by whom they are made. The said oath shall be written in the book at the end of such entries, and be certified by the officer administering the same. — Every *B.* who evades, or attempts to evade, the payment of the tax on fermented liquor, or fraudulently neglects or refuses to do any of the things by law required to be done by him as aforesaid, shall forfeit all the liquors made by him or for him, and all the vessels, utensils, and apparatus used in making the same, and be liable to a penalty of not less than five hundred nor more than one thousand dollars, to be recovered with costs for suit, and shall be deemed guilty of a misdemeanor and be imprisoned for a term not exceeding one year. And every *B.* who neglects to keep books or refuses to furnish the account and duplicate thereof as provided by law, or refuses to permit the proper officer to examine the books in the manner provided, shall, for every such refusal or neglect, forfeit and pay the sum of three hundred dollars. — Every *B.* shall affix, upon the spigot-hole in the head of every hhd., bbl., keg, or other receptacle in which any fermented liquor is contained, when sold or removed from such brewery or warehouse (except in case of removal under permit), a stamp furnished by the collector of his district, denoting the amount of the tax required upon such fermented liquor, which stamp shall be destroyed by driving through the same the faucet through which the liquor is to be withdrawn, or an air-faucet of equal size, at the time the vessel is tapped, in case the vessel is tapped through the other spigot-hole, of which there shall be but two, one in the head and one in the side, and shall also, at the time of affixing such stamp, cancel the same by writing or imprinting thereon the name of the person, firm, or corporation by whom such liquor was made, or the initial letters thereof, and the date when cancelled. Every *B.* who refuses or neglects to affix and cancel the stamps required by law in the manner aforesaid, or who affixes a false or fraudulent stamp thereto, or knowingly permits the same to be done, shall pay a penalty of one hundred dollars for each barrel or package on which such omission or fraud occurs, and be imprisoned not more than one year. — The ownership or possession by any person of any fermented liquor after its sale or removal from the brewery or warehouse, or other place where it was made, upon which the tax required has not been paid, shall render such liquor liable to seizure wherever found, and to forfeiture, removal under said permits excepted. And the absence of the proper stamps from any hogshead, barrel, keg, or other vessel containing fermented liquor, after its sale or removal from the brewery where it was made, or warehouse as aforesaid, shall be notice to all persons that the tax has not been paid thereon, and shall be *prima-facie* evidence of the non-payment thereof."

Bottling.—"Every person who carries on, or attempts to carry on, the business of bottling fermented liquor in any brewery or other place in which fermented liquor is made, or upon any premises having communication with such brewery, or any warehouse, shall be liable to a fine of five hundred dollars, and the property used in such bottling or business shall be liable to forfeiture. Beer intended for bottling must be drawn into stamped packages and removed from the brewery, and the bottling premises must be so separated from the brewery as that the beer must be carried over the public highway in its passage from the brewery to the bottling establishment. — Every *B.* shall, by branding, mark or cause to be marked upon every hhd., bbl., keg, or other vessel containing the fermented liquor made by him, before it is sold or removed from the brewery or brewery warehouse, or other place of manufacture, the name of the person, firm, or corporation by whom such liquor was manufactured, and the place of manufacture; and every person other than the owner thereof, or his agent authorized so to do, who intentionally removes or defaces such marks therefrom, shall be liable to a penalty of fifty dollars for each cask or other vessel from which the mark is so removed or defaced. — Whenever any retail dealer, or other person, withdraws or aids in the withdrawal of any fermented liquor from any hhd., bbl., keg, or other vessel containing the same, without destroying or defacing the stamp affixed thereon, or withdraws, or aids in the withdrawal, of any fermented liquor from any hhd., bbl., keg, or other vessel, upon which the proper stamp has not been affixed, or on which a false or fraudulent stamp is affixed, he shall be fined one hundred dollars and imprisoned not more than one year."

The product of U. States taxes on fermented liquors, for the fiscal year ended June 30, 1878, was as follows:

Tax of $1 per barrel of not more than 31 gals.....	$9,473,360.70
Special tax of $50 on brewers manufacturing less than 500 bbls....	62,144.67
Special tax of $100 on brewers manufacturing 500 barrels or more....	150,668.10
Special tax of $20 on retail dealers....	191,595.26
Special tax of $50 on wholesale dealers....	59,293.05
Total collections on fermented liquors......	$9,937,061.78

The percentage of each State in the above taxes was as follows:

New York	34·3082
Pennsylvania	10·0664
Ohio	9·4138
Massachusetts	5·7520
Illinois	5·9354
Missouri	5·2093
New Jersey	5·0014
Wisconsin	4·8876
California	3·6880
Maryland	2·3063
Michigan	2·1277
Iowa	1·9422
Indiana	1·8233
Kentucky	1·2395
New Hampshire	1·2016
Minnesota	1·1691
The 30 other States and Territories	7·9252
	100·0000

TABLE OF U. STATES RECEIPTS FOR TAXES FOR THE 16 YEARS 1863–1878:

Exhibiting the steady increase in the manuf. of fermented liquors.

1863	$1,628,933.82	1872	$8,258,498.46
1864	2,290,009.14	1873	9,324,937.81
1865	3,734,928.06	1874	9,304,679.72
1866	5,220,552.72	1875	9,144,004.41
1867	6,057,500.63	1876	9,571,280.66
1868	5,955,868.92	1877	9,480,789.17
1869	6,099,879.54	1878	9,937,051.78
1870	6,319,126.90		
1871	7,389,501.82		$109,717,543.59

Brewers' Grains, the refuse malt of a brewery.

Brewing. See BEER.

Bribe, a present or payment for some illegal purpose; as to a custom-house official to neglect his duty or to connive at fraud.

Brick, a common building-material of burnt clay, sand, and ashes, etc. All the ancient *B.* were made by hand. It is supposed that the Babylonian *B.* were burned in a kiln; that those which the Israelites made in Egypt were baked in the open air; while in many countries they were merely sun-dried. In making *B.* by hand, the clay, tempered by exposure to the air, is mixed with a proper proportion of sand or ashes, and kneaded in a mill to the required consistency. It then is given the proper size and shape with a mould, and after exposure during a certain time to the action of the air, is baked or burnt in clamps or kilns. *B.* are now made almost exclusively by machinery. The best machines employed for making *B.* turn out, in ordinary works, 10 moulds or 60 *B.* per minute, or 18,000 to 20,000 per forenoon. They require the following plant and helps per machine: 25 moulds, 4 trucks, and 8 men. If operated by steam, a machine turning out 18,000 per day requires 8 horse-power nominal high-pressure. In the machine here represented (Fig. 46), called the *Piston Brick-Press*, the clay passes from the hopper U into the box S; the latter is then moved by the cam K and the intermediate arm V, shifting the charge of clay over the mould M, into which it drops. The box S then retires, and the plunger O descends, being driven by toggle B, and

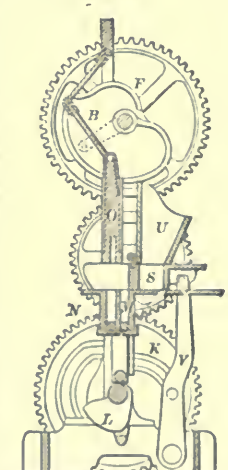


Fig. 46. — BRICK-MACHINE.

compresses the clay in mould M. The cam F, which regulates the motion of the said plunger, then causes the plunger O to rise, and cam L raises the plunger N, which removes the brick from the mould, to be swept from the table by the next forward movement of the box S. — *Burning.* Some *B.* require to be dried before burning, but not all. In the ordinary kilns there is a great loss of heat occasioned by the escape of hot air and smoke into the open air, no arrangements being made to economize it. To obviate this loss, Hoffman, of Berlin, has invented a much-improved kiln, capable of burning 25,000 *B.* per day. The kiln, 160 feet in diameter, is a kind of tunnel or arched passage running in a circle. Round the outside are 24 doors, opened or closed as may be needed; these belong to 24 compartments, into which the ring-formed passage is divided; and 24 flues lead from these compartments to a central chimney, with valves to cut off communication. There are dampers, easily opened and closed, between the several compartments. The compartments are filled with newly-made *B.* at different times, and are emptied at different times, in such a way that the heat, when it has done its work, travels on to other compartments, and is never wasted by escaping into the open air. — When the *B.* are sufficiently baked, they are divided into classes known as *cutters*, fine close-grained *B.*, rather soft, and better suited for work in which the *B.* requires cutting; *picked stocks*, *B.* of a uniform red tint; *paviors*, hard *B.* fit for paving; *common stocks*, or ordinary *B.*; *grizzles*, or soft *B.*, and *burrs*. The *B.* also vary in color, according to the degree of heat to which they were exposed. Kiln-baked *B.*, also called *malm B.*, are made of a finer clay, which contains a considerable quantity of carbonate of lime; for which reason great care is taken to prevent the air getting to the *B.* while they are baking, for this would cause the lime to pass into a caustic state; and, when exposed to the action of the atmosphere, it would absorb moisture, which would cause it to swell and burst the *B.* in pieces. Malms are used for ornamental purposes, being of a pretty buff color. They are less durable than the common *B.* Fire-*B.* are made of clay containing a considerable quantity of silicate of alumina, and as free as possible from lime in any form, or iron. The clay is carefully prepared, and the *B.* are exposed to an intense heat in kilns, as they are used in the building of furnaces and for other purposes, for which it is necessary that they should be able to withstand the action of fire. Paving *B.* are made of clay which contains a great amount of silica, that fuses when the *B.* are burnt, and causes them to become very hard. — *B.* are made almost everywhere, but those manuf. in Philadelphia, Baltimore, Milwaukee, and on the Hudson, are the best known in commerce. The size of American *B.* varies in the different States, running from 7¾ to 8½ inches in length, 4 to 4½ in width, and from 2¼ to 2½ in thickness. — *Bath B.* A scouring brick of calcareous earth, used in cleaning knives and for polishing purposes, made at Bridgewater, Somerset, England.

Brickbat Cheese, an English cheese made in Wiltshire of new milk and cream, so named from the shape of the square pieces into which it is formed.

Bricklaying, in building, the business of building with bricks.

Brick-Mould, a box in which clay for bricks is moulded into shape. It is usually destitute of top and bottom, lies upon a board which, being filled, and when lifted, leaves the brick in position to dry.

Brick-Nogging, brick-work built up between timber framing.

Brick-Tea, a kind of adulterated tea sold in some parts of Asia, formed of the refuse tea-leaves and sweepings of granaries, dampened, and pressed into a mould, generally with bullock's blood. The Tartars and Thibetans make a soup of it with milk, butter, and salt.

Bridge, any structure carried across water or a roadway, for the purpose of connecting the opposite sides of a river, gorge, valley, etc., by means of certain materials, forming a passage from one side to the other. It may be of stone, brick, iron (cast or wrought), timber, or suspended from chains or wires, in which case it is termed a *suspension-bridge.*

Bridle, a curb or leather head-piece with guiding reins and a bit for horses.

Bridoon. See BRADOON.

Brier-Wood Pipes. See WOOD-PIPE.

Brig, a vessel with two masts, square-rigged in the same manner as a ship; the spanker and spanker-boom being in the brig attached to the mainmast.

Brigantine, a hermaphrodite brig, a two-masted vessel, that is brig-rigged forward and schooner-rigged aft, with a fore-and-aft sail in place of a mainsail.

Brightening, in calico-printing, a process of rendering the color of prints more brilliant by boiling in soda, etc.

Brill, a large flat fish resembling a turbot, but inferior to it as food.

Brilliant. See DIAMOND.

Brilliants, figured shirtings made in lengths of about 16 yards.

Brimstone. See SULPHUR.

Brine, the salt water pumped up from the brine springs (see SALT). — The salt in which beef or pork is being pickled, when liquefied by the juices of the meat.

Brisbane. See QUEENSLAND.

Bristles, [Fr. *soies;* Ger. *borsten;* It. *setole;* Russ. *schtschetina;* Sp. *cerdas, setas*], the strong, glossy hairs growing on the back of the hog and the wild boar. They are extensively used by brushmakers, shoemakers, saddlers, etc. They are of various colors, but before being used for brush-making, they are sorted into *black, grey, yellow, white,* and *lilies.* The lilies are silvery white in color, and are used for the best shaving- and tooth-brushes. The *B.* vary from 3 to 10 inches in length, the moderately long being better than the very long. The white are better than the yellow and the yellow better than the black; the wiry are better than the limp. Other things being equal, the thickest *B.* are the most sought after, and fetch the highest price per pound. The improved breeds of the hog are almost without hair, and the few they have are too soft; American *B.* are therefore of little value. Our supplies of *B.* are chiefly obtained from Russia, where the wild boar abounds, and to a small extent from Belgium, France, and Germany. They come tied into bundles and packed into casks containing from 400 to 500 pounds each. The value of *B.* imported in 1878 was $614,110. *Imp.* duty, 15 cents per pound.

Bristol. See GREAT BRITAIN.

Bristol-Board, is a kind of strong card or

pasteboard, made smooth by glazing, and largely used by artists. The sizes are cap, demy, and medium, and of two and three sheets in thickness. It was first made at Bristol. In England, however, the first quality of drawing-boards is known as *London board*. *Imp.* duty, 35 per cent.

Bristol-Stone, a kind of quartz or rock-crystal, found at Clifton near Bristol, and used for vases, urns, mirrors, etc. The finest specimens, when cut and polished, are known as *Bristol diamonds*. *Imp.* duty, 10 per cent.

Britannia Metal, is a compound of tin and antimony, in the proportion of about 10 to 1, with sometimes a little zinc and copper. It is almost as white and brilliant as silver, and is hence very largely employed in making coffee and teapots, hot-water jugs, soup tureens, gravy and vegetable dishes, wine-coolers, liqueur stands and waiters, and other articles of table service — appearing something like silver, but much cheaper. It has remarkable ductility, which enables it to be worked by the process of *metal-spinning;* in which thin sheets are burnished or swaged down upon wooden moulds or other models, to the convexities and concavities of which they adapt themselves with remarkable facility. *Imp.* duty, 35 per cent.

Britannia Ware, or BRITISH WARE. See ALBATA.

Britannias, a kind of fine linen, exported in pieces from England to South America.

British Brandy, a common kind of brandy; a rectified and flavored corn-spirit, highly colored, and made in London.

British Gum. See DEXTRINE.

Britt, a very small kind of herring, *Clupea minima*, which sometimes appears in incredible numbers on the American coasts, serving as food for other fish.

Britzska, a travelling carriage or chariot.

Broach, a tool or fitting for an Argand gas-burner.

Broad-Cloth, a fine kind of woollen for men's garments, exceeding 29 inches wide; all of less width are known as narrow cloths.

Broad-Gauge. See GAUGE.

Broad Glass, inferior or spread window-glass.

Broadside, a printer's term for a full printed page of any sized sheet. — The full length or side of a ship.

Brocade, a stuff of stout silk, raised and enriched with gold and silver flowers, foliage, etc., which was held in high repute for the dresses of both sexes during the 17th and 18th centuries. — A cloth of gold and silk, which in Eastern countries bears the name of *kinkbobs*.

Brocatelle, the French name for linsey-woolsey.—A silk material for drapery, linings for carriages, etc.

Broccoli, the *Brassica oleracea*, a variety of the cabbage, and a highly esteemed garden vegetable. It has considerable resemblance to cauliflower, from which it differs by the purple or green color of its heads.

Brogans, are rough-made and heavy shoes, chiefly worn by laborers and miners.

Brogues, the shoes of the Irish peasantry. — A name for breeches.

Broken-Backed, a term applied to a vessel which is hogged or loosened so as to droop at each end.

Broker, a person employed as an agent or middleman to transact business between merchants or other individuals. *B.* generally confine themselves to negotiations for the purchase and sale of some particular articles, by which means they acquire an intimate knowledge of their qualities, as well as an acquaintance with the sellers and buyers, and the state of supply and demand; and they are thus enabled to negotiate between dealers on terms equitable for both. A merchant seldom has the same intimate knowledge for his guidance, and therefore generally finds it advantageous to effect his purchases and sales through the medium of *B.* In large commercial places, there are separate *B.* for almost every leading article of trade, as cotton *B.*, tea *B.*, produce *B.*, etc. Besides the commercial *B.* there are other kinds of *B.*, for which see CUSTOM-HOUSE *B.*, EXCHANGE *B.*, INSURANCE *B.*, NOTE *B.*, SHIP *B.*, STOCK *B.* See also PAWNBROKER.

Brokerage, the commission or percentage paid to brokers on the sale or purchase of bills, funds, goods, etc. See COMMISSION.

Brom, a fermented liquor made from glutinous rice in Java.

Bromine, a substance obtained by a chemical process from the uncrystallizable residue of sea-water, commonly called *bittern*. It is a liquid of a deep reddish-brown color and disagreeable, suffocating odor. Sp. gr. 3. It is used in medicine for the same purpose as iodine, and also to some extent in photography. It bleaches as well as chlorine, but is poisonous to animal life. *Imp.* free.

Bronze, [Fr. *bronze;* Ger. stückgut, *stückmetall;* It. *bronzo;* Sp. *metal de canones*,] an alloy of copper and tin, much harder and more fusible than copper, but less malleable. When well prepared it is the most durable of metallic materials, except gold, platinum, and some rare metals. It is much used for bells, cannon, large statues, toothed wheels, and other castings, as well as for fine ornamental statuettes, figures, clocks, cups, etc., and various kinds of stamped work. So greatly do the proportions vary, that while large bell *B.* has only 3 parts of copper to 1 of tin, machinery *B.* has often 10 to 1. The usefulness of this alloy depends chiefly on its being very hard and very durable; but it is also sonorous and pleasant in color. *Bronzes* is the common name for *B.* statuettes, figures, and other ornamental *B.* goods. *Imp.* duty (*B.* and all manuf. of), 35 per cent.

Bronze Paint, or **Gold Paint**, a mixture of gold-colored bronze powder with turpentine divested of its acid.

Bronze Leaf. See DUTCH LEAF.

Bronze-Powder, a metallic powder resembling gold dust, and prepared in every shade of colors, by reducing Dutch leaf into powder by levigation with oil, to prevent oxidation. The principal uses of bronze colors are for japanning and bronzing tin and iron goods, statues, gas-fittings, papier-mâché work, printing, ornamental painting, and such like purposes. They are chiefly imported from Germany. *Imp.* duty, 20 per cent. See DUTCH LEAF.

Bronzing, is the process of covering articles of metal, wood, clay, plaster, etc., with bronze powder or other compositions, which give to them the appearance of bronze. The process and the composition of the coating vary with the articles to be coated.

Brood-Mare, a mare kept for breeding from.

Brooklyn, a city and seaport of the U. States,

cap. of King's Co., New York State, at N. W. end of Long Island, opposite New York city, from which it is separated by an arm of the sea called the East River, which is ¾ of a mile wide, and with which it will soon be connected by a suspension-bridge now building, which is a marvel of modern engineering. *B.* has an extensive water-front; and along the shore immense works have been constructed to facilitate commerce, the Atlantic Dock alone containing an area of 40 acres, with sufficient depth of water for any vessel. The docks and piers at South *B.* are among the most extensive and commodious in the country. Ship- and boat-building and repairing are extensively carried on at East *B.* and the N. E. part of the city called Green Point. Upon Wallabout Bay, a deep indentation of the sea between East and West *B.*, is located a U. S. Navy-Yard, occupying an area of 45 acres. In the extent and variety of its manufactures, *B.* ranks among the first cities in the Union. *B.* has also considerable shipping interests, but its trade is so intimately connected with that of New York, that, commercially speaking, *B.* can scarcely be said to have an independent existence. *Pop.* about 500,000. See NEW YORK.

Brooklyn Bridge. See EAST RIVER BRIDGE.

Broom, is a name common to several shrubs. The branches of the common *B.* of Europe, *Cytisus scoparius,* are used for making brooms, and its young tops and seeds, which are strongly diuretic, are used in medicine. The flowers of the greenwood or dyers' broom, *Genista tinctoria,* yield a bright yellow coloring matter, used by dyers.

Broom-Corn, a kind of grass, *Sorghum vulgaris,* chiefly cultivated for its stalk, to make brooms. The tops are cut about two feet long, packed in bales, and sold by the 100 lbs. This plant is extensively grown in New York, New Jersey, and other parts of the U. States.

Broom-Handle, a slight wooden stick, made of light wood as ash, pine, etc., and prepared to fix in broom-heads. They are manuf. in almost all the Northern and Eastern States, and sold by the 100 or by the 1,000, in bundles.

Broom-Head, in broom-making, a clasp or cap for holding the bunch of broom-corn, so that a worn stump may be removed, and fresh brush substituted. There are broom-heads of very many forms.

Brooms, [Fr. *balais;* Ger. *besen;* It. *scope;* Sp. *escobas,*] well-known utensils, so called from having been originally made in England of broom twigs. In America they are generally made of broom-corn, and from hickory saplings made into splits. Fine hair-brooms are imported from France and England. *Imp.* duty for all kinds of brooms, 35 per cent.

Brougham, is a closed carriage, with a single inside seat for two persons, and an elevated driver's seat. The front is glazed, and the fore-wheels turn on a short lock.

Brow-Band, is a band of a bridle, head-stall, or halter, which passes in front of the horse's forehead, and has loops at its ends, through which pass the check-straps.

Brown, a dark, dusky, tertiary color, which is a mixture of red and black of various degrees of depth. *B.* pigments, employed by painters, are derived from the mineral and vegetable kingdoms, but chiefly the former. They comprise *umber, raw* and *burnt sienna, bistre, brown madder, Vandyke, Spanish B., purple B.,* washed *B.,* and others. In glass and enamel painting, *B.* effects are often produced by substances which are not *B.* in themselves, such as sulphates of some of the metals; while in dyeing and calico printing, *aniline, annotto, fustic, sumach, logwood,* and *alum* are all employed in various ways to produce browns.

Brown Coal, a variety of lignite, of a brownish-black color, of which there are beds on the borders of Cheesequake Creek, in Middlesex Co., N. J. It differs from stone-coal by its tendency to split and fall to powder when exposed to the air, and by containing water, which interferes with its value as fuel.

Brown Cottons, are unbleached muslins, which vary from 27 to 108 inches in width, and are used for sheetings, shirtings, etc. Their relative prices depend on their weight and trade-mark.

Brown Grease, a grease obtained by pressure from wool skins. *Imp.* duty, 20 per cent.

Brown Hemp, a name in Bombay for the valuable fibre of *Crotolaria juncea.*

Brown Holland, an unbleached linen, used for various articles of clothing and upholstery. It chiefly comes from Scotland. *Imp.* duty, 35 per cent.

Browning, a shining brown lustre given to surfaces of articles of metals, as gun-barrels, etc., by chloride of antimony, or other compounds.

Brown Ochre, a peroxide of iron.

Brown Paper, is a coarse kind of wrapping-paper, made from unbleached junk, hemp, refuse flax, etc. There are various qualities, from *manila* to *straw.*

Brown Spar, a crystallized form of carbonate of iron.

Brown Stone, a dark variety of the red sandstone, chiefly brought from quarries on the Connecticut River, and much sought for in New York as a building-stone.

Brown Stout, a fermented liquor; a superior kind of porter.

Brown Sugar, the common dark Muscovado sugar. In commerce the term is applied to all grades of sugar which are not whitened by the refining process. See SUGAR.

Brown Ware, a common variety of pottery, named from its color.

Brow-Post, a carpenter's term for a beam that goes across a building.

Brucine, or BRUCIA, a very bitter and poisonous vegetable alkaloid, extracted from the bark of the *Strychnos nux vomica.* It is characterized by giving a blood-red color with concentrated nitric acid. Its toxicological effects are like those of strychnia, but it is far less active. Average cost in New York, $3 per ⅛ oz. *Imp.* duty, 40 per cent.

Bruiser, a concave tool used in grinding lenses or the specula of telescopes.

Bruising, in leather manuf., the process of extending and rubbing on the grain-side, after it has been *grained* by folding grain-side in, and rubbed with a *crippler.*

Bruising-Machines, are crushing machines for breaking or grinding pulse, oats, Indian corn, etc., for cattle.

Bruising-Mill, a hand-mill in which grain for feed, malt for brewing, and flax-seed for pressing, are coarsely ground. It consists of two cast-iron rollers mounted on a strong frame, and so arranged that grain is carried between them and crushed more or less according to the degree to

which the rollers are tightened up by the hand-screw at the end of the frame.

Brujula, the Spanish name for the mariner's compass.

Bruneta, a kind of coarse black Spanish cloth.

Brunswick, [Ger. *Braunschweig*,] a duchy of the empire of Germany, consisting of five detached portions of territory, occupying part of the immense plain extending from the Hartz Mountains to the German Ocean, and contiguous to Hanover and Prussia. *Area*, 1,526 sq. m. *Pop.* 327,493. Capital, Brunswick, an old but fine city on the Ocker, 8 m. S. E. of Hanover; *pop.* 65,938. The government is a constitutional monarchy, regulated by the fundamental law of Nov. 28, 1851.

The northern districts, particularly Wolfenbüttel, have an undulating surface, and their soil is highly productive; the southern, including the Blankenburg territory, which lie within the limits of the Hartz, are composed of a succession of mountains, in part well wooded and studded with highly cultivated valleys. The aspect of the whole of the duchy is indicative of good order and prosperity. The principal articles of home manufacture exported, are timber, yarn, linen, grain, oil, chicory, madder, leather, hops, and ironware. *B.* has no coast, but it communicates with the German Ocean by means of the Weser and the Elbe.

Finances. The annual revenue is about $7,000,000, with expenditure of same amount. The public debt in 1878 was 91,874,442 marks, or $22,968,610, mostly contracted for the establishment of railroads.

Money, Weights, and Measures. See GERMANY.

Brunswick Green. See VERDITER.

Brush, [Duster, Fr. *brosse;* Ger. *bürste.* Paint-brush, Fr. *pinceau;* Ger. *pinsel*,] a daubing and cleansing implement, of which there are endless varieties, for clothes, the hair, sweeping, painting, white-washing, etc. They are generally made of hogs' bristles, the whiter and better kinds being employed for hair-, tooth-, clothes-, and hat-*B.*, and also for the better classes of paint-*B.* The bristles are first sorted according to color, and then, by means of a series of combs, having teeth formed of needles of various sizes, and placed at different distances apart, they are assorted according to size, by employing at first the largest comb and then in succession the smaller ones, fixed to a work-table.—*Paint-B.*, the simplest form of *B.*, is made by inserting full-length bristles between two projecting prongs on the handle, and securing them by a wrapping of twine, which is afterward protected by a coating of glue mixed with red-lead. In other paint-brushes the bristles are surrounded by a metallic cap, which binds them to the handle. In large paint-brushes and painter's dusters, the handle is secured by driving its smaller end foremost into the bristles, placed within an iron cup, which binds them fast. — *Hair-B.*, *Dusters*, etc., are made by inserting tufts of bristles into a stock or head previously bored with holes for their reception. These are frequently bored angularly to the face, or the face itself is rounded so as to give the tufts an outward splay when inserted; the root-ends are first dipped into melted pitch, then bound with thread, again dipped, and then inserted with a sort of twisting motion. *B.* of this description are usually made with bristles of the full length, but where stiffness is required, as in scrubbing, hair, and other similar brushes, each tuft of bristles is doubled so as to present both ends outward; these are then cut off square and even, presenting a hard surface, especially when the doubling is made near the root-ends. The best sorts of *B.* are *trepanned;* in this process a number of holes are drilled in the bone back either transversely or longitudinally, and a number of holes are sunk through to these from the face-side of the brush; the tufts are then drawn with strong threads or silk, and the longitudinal or transverse holes filled with plugs of bone or ivory. Whalebone cut into strips, and split, is used in the same manner as bristles, to form *B.*, either by itself or in conjunction with bristles. In the latter case, the adulteration is soon detected by the more rapid wear and splitting of the ends of the whalebone. The *Woodbury's B. machine* is now used for making common *B.* — The smallest kind of *B.*, called *pencils*, are used in water-color, and some kinds of house, sign, and coach painting. They are made by inserting a tuft of camel, badger, squirrel, goat, fitch, or sable hairs with their roots bound together into a quill previously softened, which, in drying, serves to hold them fast; for the larger size, a tin tube, either round or flat, is employed.

Brush-Weir, a weir formed of stakes, driven at regular intervals, and interwoven with twigs, for catching fish in shallow bays, rivers, etc.

Brush-Wheel, a circular, revolving brush, used by the turner or lapidary for polishing, etc.

Brussels. See BELGIUM.

Brussels-Carpeting. See CARPET.

Brussels-Lace. See LACE.

Brussels-Sprouts, small delicate sprouts, produced in the axils of the leaves of a variety of the common cabbage. They are used as a pot-herb.

Bryony Root, the acrid root of black bryony, *Tamus communis*, by some considered a good substitute for sarsaparilla. The young shoots are eaten as asparagus in Italy.

Bubble, a small glass bead or hollow floating globe for testing the strength of spirits. — A familiar name applied to a fraudulent or unsubstantial commercial project, which holds out hopes of rapid gain, for the purpose of enriching the projectors at the expense of sanguine and ignorant adventurers; and particularly used to designate those projects the funds for which are raised by the sale of shares or subscription to a transferable stock. The term, which originated in England at the beginning of the last century with the collapse of the South Sea scheme, is now seldom used.

Buchu Leaves, the leaves of *Barosma crenata*, a small shrub growing at the Cape of Good Hope. They have an aromatic smell, and are esteemed in pharmacy for their diuretic properties. *Imp.* free.

Buck, a male rabbit; also applied to deer, to a ram, and to a male goat.

Buckbean, a name for the marsh trefoil, *Trifolium paludosum*, which has some medicinal properties, being tonic and cathartic.

Bucket, a lifting pail or vessel for holding water, made of wood, leather, metal, gutta-percha, or other material.

Buckhorn, a name in the west of England for any fish salted or dried in the sun.

Bucking, the process of cleaning or bleaching linen and cotton goods in an alkaline lye.

Buckingham-Lace, a common description of lace resembling Alençon lace.

Bucking-Hammer, an instrument for crushing ores fine for sampling.

Buckle, a link of metal or other substance for fastening harness, belts, or parts of dress together. They are used as fastenings for shoes, knee-bands,

ladies' waist-belts, etc. *B.*, as shoe and knee ornaments, have gone out of fashion. *Imp.* duty, according to material.

Bucke-Chape, the part by which the buckle is affixed to the band.

Bucklers, are blocks of wood made to fit in the hawser-holes of a ship.

Buckram, [Fr. *bougran;* Ger. *schettre;* Port. *olandilha;* Sp. *bucaran,*] a coarse kind of linen or cotton fabric, having a peculiar stiffness imparted to it by strong gum and calendering, and chiefly used in the making of clothes, to keep them in the proper shape. *B.* are ⅞ wide; when formed of cotton, they are generally in pieces of 28 yards in length; when of linen, 25 yards.

Buckskin, the white tanned skin of the common deer, from which gloves are made. The name, however, is frequently given to the tanned skins of the kid and goat, sheep, and lamb, and sometimes to calf-skins. *B.* leather is used for boots and shoes, breeches, saddle-seating, braces, polishing leathers, etc. *Imp.* duty, 25 per cent.

Buck-Thorn, is the *Rhamnus catharticus.* A syrup is made from the berries, which is used in medicine. The juice stains the paper green.

Buckum-Wood. See JAPAN WOOD.

Buckwheat, [Fr. *blé sarrasin, blé noir;* Ger. *buchweizen, heidekorn;* It. *grano saraceno;* Port. and Sp. *trigo saraceno, trigo negro,*] a kind of grain, of a triangular form, produced by the *Fagopyrum esculentum,* an animal plant which grows on the poorest soils, with a strong branching stem of a reddish color. Its grain, when ground, produces a fine flour, which, in the poorest districts of France and other European countries, is made into bread, which is very wholesome. In the U. States, the *B.* flour enters into the composition of the well-known and delicious *B. cakes* (called in England *crumpets*). The grain is, next to Indian corn, the most valuable food for cattle, horses, poultry, etc. In this country two-thirds of the *B.* crop is annually produced in New York and Pennsylvania, to meet the winter demand for *B.* flour in the seaboard cities. The area of its cultivation is small, and not very rapidly extending, as shown in the following statement:

Years.	Bushels.	Value.	Value per bushel.	Value per acre.
1870	9,841,500	$7,725,044	$0.78·4	$14.38
1871	8,328,700	6,900,268	82·8	16.67
1872	8,133,500	6,747,618	82·9	15.04
1873	7,837,700	6,382,043	81·4	14.05
1874	8,016,600	6,477,885	80·8	14.31
1875	10,082,100	7,166,267	71·0	12.45
1876	9,668,800	7,021,498	72·6	10.53
1877	10,177,000	6,998,810	68·7	10.76
Total......	72,085,900	$55,419,433	....	....
Average..	9,010,737	$6,927,429	$0.76·8	$13.20

Buck-Yam, the *Dioscorea triphylla,* which is a native of Java, and is also grown in the West Indies for its tubers.

Bucosidad, the Spanish term for tonnage or capacity of a ship.

Bude Light, is an extension of the principle introduced in the Argand lamp. There is not only one cylindrical ring of burners, but sometimes two, and even three, are placed concentrically; and, to produce very powerful effects, the interior of the flame is fed with oxygen instead of common air.

Budget, is the name applied in several countries of Europe to the annual statement of the public revenue and expenditure, submitted in England by the Chancellor of the Exchequer to the House of Commons, and in France by the Minister of Finances to the Chamber of Deputies. The accounts which accompany the statement show on one hand the sums required for the public service during the year, under the heads of Army, Navy, Public Instruction, etc., together with any incidental charges; and on the other hand are given the *Ways and Means* for meeting the same, consisting of the surplus (if any) of the preceding year, the annual taxes and duties, and such incidental receipts as come in aid of the national revenue.

Buenos Ayres. See ARGENTINE CONFEDERATION.

Buff, a color somewhat between pink and primrose-yellow. — Leather prepared from the skin of the buffalo, elk, etc., by imbuing it with an aluminous compound, and afterwards some oily matter; formerly much used for waist-belts and other military accoutrements. — A wheel coated with buff-leather, and used in polishing cutlery, etc.

Buffalo, a large and beautiful city and port of entry of the U. States, cap. of Erie co., in the State of New York, in lat. 42° 53′ N., lon. 78° 55′ W., situated at the E. extremity of Lake Erie, where it contracts into Niagara River, 22 m. S. of Niagara Falls, and 293 m. N. W. of New York city. *B.* is the third city of the State in population and wealth; it is the western terminus of the Erie Canal, and it has railroad trunk lines in almost every direction. Commanding the bulk of the trade of the Great Lakes by its numerous vessels, and controlling a large Western business by its almost unlimited railroad facilities, *B.* has long been a most important commercial entrepôt. It has large manuf. of agricultural implements, car-shops, flouring-mills, etc.; it has also numerous blast-furnaces, rolling-mills, machine-shops, stove-foundries, iron shipyards, etc. Its manuf. interests are steadily and rapidly increasing. It is, however, to its enormous traffic in grain that *B.* owes much of its importance and wealth. There are along both sides of the creek 30 elevators, having an aggregate capacity for storage of 7,000,000 bushels, and daily transfer capacity of 3,000,000 bushels. Separated only from Canada by the Niagara River, *B.* has with that country a very large trade. In 1878 its imports from Canada amounted to $3,258,576, and its exports to same to $193,684. *B.* creek is navigable for about 8 miles, and admits vessels drawing 14 feet of water. A pier, 1,500 feet in length, with a light-house upon it, facilitates the navigation; but, owing to the accumulating of ice at the end of the lake, the harbor becomes inaccessible during the cold months of the year. In 1878 the port was entered by 162 American and 293 foreign vessels, having an aggregate tonnage of 69,115; and cleared by 138 American and 264 foreign vessels, whose aggregate tonnage was 58,590. The registered marine of the port, on the 1st of Jan., 1879, was 224 vessels, of 99,529 tons, of which 119 were steam vessels. Two extensive establishments are devoted to iron ship-building; these have constructed the finest lake steamers, besides supplying the Government with a number of iron revenue vessels. *Pop.* about 150,000.

Buffalo and Southwestern R.R., runs from Buffalo to Jamestown, N. Y., 66.5 m. This Co., whose offices are in Buffalo, was organized under its present title in 1877. Cap. stock authorized, $2,000,000; subscribed, $1,379,400; paid in, $1,-367,343.95; funded debt, $1,432,695, interest 6%; and floating debt, $127,706.47.

Buffalo, Bradford, and Pittsburg R.R., runs from Carrollton, N. Y., to Gilesville, Pa., 25.97 m. This Co. was formed in 1859, by the consolidation of Buffalo and Pittsburg R.R. of N. Y., and Buffalo and Bradford R.R. of Pa. The road was opened in 1866, and leased to the Erie R.R. Co. for 499 years. Cap. stock, $2,286,000; mortgage bonds, $580,000, payable 1896, interest 7%.

Buffalo Hides, are the hides of the tame buffalo of India. They are largely exported from Manilla and other Eastern ports.

Buffalo, New York, and Erie R.R. This line runs from Buffalo to Painted Post, N. Y., 139.95 m., and was organized in 1858 as successor to the Buffalo, Corning, & New York R.R., bankrupt. In 1863 it was leased to the Erie R.R., at an annual rent of $233,100. Cap. stock, $950,000; funded debt, 7% bonds, $2,380,000.

Buffalo, New York, and Philadelphia R R., runs from Buffalo, N. Y., to Emporium, Pa., 120.55 m. This Co., originally the Buffalo & Allegheny Valley R.R., was chartered under its present title in 1871. Its offices are in Buffalo. *Financial Statement:* Cap. stock authorized, $3,500,-000; subscribed, $2,383,100; paid in, $1,968,950. Funded Debt: first mortgage 6% bonds, payable 1896, $3,000,000; second mortgage 10% bonds, payable 1893, $807,500; total, $3,807,500; floating debt, $711,339.29. Total, $4,518,839.29. Net earnings for 1877–78, $450,449.15.

Buffalo-Robes, the unshorn, furry, dressed skins of the buffalo or bison of the regions of the Rocky Mountains (Fig. 47), of which thousands of

Fig. 47. — Bison, or American Buffalo.

bales are still annually forwarded to the Eastern markets of the U. States and Canada, though the animal is becoming less year by year. *Imp.* duty, 20 per cent.

Buffer, a striking-block with elastic springs attached to a railroad carriage, for deadening the concussion received from the engine.

Buffet [Fr.], a kind of open cupboard or sideboard, on which plate and glass are kept for ready use, or for show.

Buggalow, a crazy, ill-built, decked vessel, used in the coasting trade of the peninsula of India, with one mast and a latin sail.

Buggy, in the U. States, a light four-wheeled carriage with a movable calash top; in England, a sporting dog-cart; in India, a kind of gig.

Bugle, a kind of glass bead, formed into small capillary pipes, and broken into various lengths, used for ornamenting dresses. They are chiefly made in the Levant, Austria, and North Italy. *Imp.* duty, 50 per cent. — A brass musical wind instrument, which has been improved by the addition of six keys so as to be capable of all the inflections of the scale. It is also called Bugle-horn. *Imp.* duty, 30 per cent.

Buhl-Work, is a kind of inlaying, in which a metal ornament is inserted in wood in such a way that both may be brought to the same level. The art was carried to much perfection by M. Buhl, a French cabinet-maker, in the time of Louis XIV. He usually employed a brass inlay upon tortoise-shell; but the combination may be varied almost *ad infinitum*, the two substances being usually as thin as veneers. The two veneers are glued to the opposite sides of a piece of paper; another piece of paper is glued or pasted to the outside of one of them; the device or pattern is drawn on the outside paper; and then the two veneers are cut through and through, following the line or lines of the device. This cutting is effected with a *buhl saw*, very fine, narrow, and thin, and fixed in a bowed or arched frame. When the cutting is completed, the two layers can easily be separated; and then *two* pieces of buhl-work may be produced, for each one serves as an inlay to the other. These inlays are placed as veneers to the surface of a cabinet, work-box, or any other article of ornamental furniture. Buhl, the cabinet-maker, mostly employed, as we have said, brass upon tortoise-shell; Reisner, a contemporary in the same trade, preferred tulip-wood upon some darker wood; and this is the chief difference between *buhl-work* and *reisner-work*. But the same principle will apply to ivory, mother-of-pearl, and a large number of other substances. Cheap imitations of buhl-work are produced by cutting out the veneer patterns with a stamping-press, instead of by sawing.

Builder, one who superintends and carries out building operations from the plans of an architect.

Builders' Materials, lime, cement, sand, hair, lathes, &c.

Builders' Measurement, a distinction in the admeasurement of mercantile tonnage; builders' admeasurement being nearly double the legal registered tonnage of a ship.

Bujran, a round-bottomed barge without keel, containing two or three cabins, used on the Ganges.

Buke-Muslin, or Book-Muslin, a plain, clear kind of muslin, woven for working in the tambour, and used for ladies' dresses.

Bulk, the whole dimensions of anything. The chief contents of a ship's cargo when laden; as, iron formed the *B.* of her freight. — A sale of merchandise by *B.* is a sale of a quantity such as it is, without measuring, counting, or weighing. — *Stowed in B.*, in shipping, is to have the cargo loose in the hold, and not packed in bales, cases, &c.

Bulkheads, the divisions or partitions of wood or iron which separate the interior of a ship into rooms or compartments. They are now often *water-tight*, being plates of iron so closely fastened to the sides, decks, beams, etc., as to render each compartment water-tight, and therefore buoyant, in case of injury to other compartments by wreck or by an enemy's shot.

Bull, in the language of the Stock Exchange, is a speculator who binds himself to take certain stocks or bonds at a price then fixed, said bonds to be delivered only at some future date. The difference in the price between time of sale and time of delivery makes the profit or loss on the transaction; for the purchaser buys what he does not

wish to receive, and the seller, called in the same language a *bear*, sells what he does not possess. If the stocks have at date of delivery increased in value since the date of sale, the balance is paid by the seller to the buyer; if the reverse, the seller receives the difference. Thus the interest of each party to the contract lies in the rise or fall of price of the stocks, and many stratagems are resorted to by the *B.* to increase the market price of the stocks, and by the bears to decrease it. It is a recognized form of gambling, by which vast sums change hands daily.

Bullah, a measure of weight for grain in Mysore, equal to $4\frac{1}{4}$ lbs.

Bullen-Nail, a nail with round head and short shank, tinned and lackered, and used principally for hangings of rooms.

Bullet, is the general name for any kind of leaden projectile discharged from a rifle, fowling-piece, or pistol. Since the perfecting of the rifle, *B.* have been made oblong, egg-shaped, or pointed at one end, and scrupulously formed at every part. *B.* were formerly singly cast in moulds. In 1855, Robert Napier, a Scotch engineer, invented a machine to make them by compression, insuring much truer sphericity of form than before, and producing 40,000 *B.* a day. Other machines have been since invented, which are doubly as rapid in their action as Napier's.

Bullet-Mould, a mould for casting leaden balls for guns, etc.

Bullion, the commercial term for uncoined gold and silver, either when smelted and not perfectly refined, or when refined and melted down in bars or ingots. In political economy, the term is frequently used to denote the precious metals, both coined and uncoined. *Imp.* free. See Gold and Silver.

Bullion-Brokers, a dealer in precious metals, either coined or uncoined.

Bullock, a gelded bull.

Bullocks' Hides, a commercial name for the raw hides of cattle.

Bullock-Yoke, a wooden neck-yoke or collar for draught cattle.

Bull's-Eye, a small thick piece of glass let into the deck of a ship to admit light to a cabin. *Imp.* duty, 35 per cent. – A ship's block, a wooden thimble without a sheave, having a hole through the centre, and a groove round it. — The centre of a target.

Bull's-Mouth, a trade name for a species of helmet shell, *cassis ruta*, from which those cameos are cut that have a pale salmon color on an orange ground.

Bulrushes, the leaves of a marshy plant (*Scirpus lacustris*), which are employed in many parts of Europe for making mats and winter coverings for plants, for chair bottoms, etc. For shipping they are packed in bundles of about 36 inches in circumference, 63 bundles making a load. They come chiefly from Russia and Holland. *Imp.* duty, $15 per ton.

Bulwarks, the parapet of woodwork raised around a vessel's deck, for the purpose of preventing men and goods from slipping overboard, and at the same time for protecting the deck from the waves.

Bumboat, a boat which supplies provisions to a ship in harbor or in a roadstead.

Bun, or Boon, a name in India for coffee-berries before they are ground.

Bunch, a number of things of the same kind which are or are put together; a cluster. Bananas are sold by the bunch.

Bunch Raisins, are raisins of a superior quality, dried and packed in bunches. The best come from Malaga.

Bunder-Boat, a strong, well-built boat, employed to land passengers from vessels on the pier at Bombay.

Bundle, a package or parcel made up loosely. — Two reams of printing paper.

Bung, a large cork or wooden stopple for a cask.

Bunt, the middle of a ship's sail.

Bunting, a thin, open-made kind of woollen worsted stuff goods, used chiefly for flags, colors, and ships' signals. *Imp.* duty, 20 cents per square yard, and 35 per cent.

Buoy [Fr. *bouée;* Ger. *ankerboye*; It. *gavitello;* Sp. *boya*], a floating mark or sea-beacon, usually made of copper or iron, but sometimes of cork, wood, etc., anchored over some danger, or placed at certain spots to mark the channel. They are also fastened to moorings for vessels to make fast to in harbor, or to warp by, and to indicate the position of the anchor of a ship.

Bur, or Burr, the rough, prickly head of the burdock, chestnut, etc.; a general name for any kind of grass seed which attaches itself to the sheep's fleece; *burry wool* requires more labor to clean it for manufacturing purposes. — A clinker-stone or brick. — A small circular saw. — A sort of triangular chisel.

Bur-Bark, a fibre obtained from the *Triumfetta semitriloba*, a common weed in the West Indies.

Burden, a load. – The contents of a ship; freight; cargo; the tonnage capacity of a vessel; as, a ship of 500 tons burden.

Burdock, the *Arctium Bardana*, a biennial plant, common in uncultivated places, the roots of which being aperient, diuretic, and sudorific, are used in medicine.

Bure, a coarse woollen cloth of a dark color, made in Finland.

Bureau, the French name for office and for desk. — In America, a chest of drawers.

Burgee, a kind of small coal, suited for burning in the furnaces of engines. — A three-cornered flag or distinguishing pennant used by cutters, yachts, and merchant vessels.

Burgermeister, the mayor or chief magistrate of a Dutch city or Flemish town.

Burgundy Pitch, the resin of the white pine (*Pinus alba*), is usually in softish masses of an aromatic odor, and a pale yellowish brown color, often intermixed with white streaks, and occasionally in rounded masses or tears, which have spontaneously exuded from and dried upon the trees. This resin is likewise obtained by incision of the bark; the different portions, being collected, are dissolved in boiling water, and cleansed by pressing through canvas cloths. *B. P.* is imported from Saxony and the north of Europe. Its only use is as an ingredient in some plasters. *Imp.* free.

Burgundy Wines, are perhaps the most perfect of all the known wines in the qualities that are deemed most essential to vinous perfection. The flavor is delicious, the bouquet exquisite, and the superior delicacy which they possess justly entitle them to be held first in estimation of all the red wines known. They cannot be mixed with any other; even two of the first growth, mingled, deteriorate the quality, and injure the bouquet. There is an infinite variety in the wines of *B.*, which an American can hardly comprehend. Accustomed to wines and liquors less delicate than intoxicating, his favorite beverage is chosen rather for strength

than perfection of flavor. The nature of the soil, the aspect, the season, the plant, and mode of culture, as well as the making, each and all equally affect the quality of these wines more than wines in general. The most finished and perfect *B.* is deteriorated even by a short voyage, and to drink it in perfection in this country, it must be imported in bottle. The best *B.*, called the *têtes de cuvées*, are from the choicest vines, namely, the *noireau* and *pineau*, grown on the best spots in the vineyard, having the finest aspect. These rank first in quality, and are wines, when well made in favorable seasons, which contain every excellence that the most choice palate can appreciate. Fine color, enough of spirit, raciness, good body, great fineness, an aroma and bouquet very powerful, strong in odor, and that peculiar taste which so remarkably distinguishes them from all the other wines of France. The next, called *les prémières cuvées*, or *vins de primeur*, approximate very closely to the first class in quality, except that the perfume is not quite so high. The quantity of alcohol in *B.* wines is said to be 13.50; but in this respect there is considerable variation in the return of the experiments, as no two wines are exactly alike in point of strength.

Ancient *B.* now forms the three French departments of Côte d'Or, Saone et Loire, and Yonne. The wine district is situated under the 45th and 46th degrees of latitude, and is about 150 m. long by 75 wide. The most celebrated district is the Côte d'Or, thus named on account of the richness of its vineyards. It consists for the most part of a chain of gentle calcareous hills, which extend N.E. and S.W. from Dijon into the department of Saone et Loire, including a small part of the arrondissement of Dijon, and all that of Beaune. The training of the vines is the low method, on sticks about three feet long. It is unnecessary to mention the lower growths of the wines of *B.*, because they are rarely exported. It will snffice to take a cursory notice of those wines which are best known out of France. The arrondissement of Dijon produces the red and white *Chambertin*. They also make there an effervescing Chambertin, a wine only inferior to very good Champagne, but it wants the delicate bouquet of Champagne, by the absence of which it is easily detected. The French complain of its having too much strength, but this would recommend it in America. It is a very delicate wine, notwithstanding, and highly agreeable to the palate. In spirit it is perhaps a little above the average of Champagne, which it resembles so much, that persons not judges might easily mistake the one for the other. The Chambertin of Dijon rivals the best wine produced in the vine ground of Beaune for excellence. The vineyard that yields it is small. It is a wine of great fulness, keeps well, and the aroma is perfect. It is sold at 350 to 400 francs per hectolitre, immediately upon making. At *Bèze*, *St. Jacques*, *Musigny*, *Clos Bernardon*, *Clos du Roi*, etc., most excellent wine is made. In the *Clos de la Perrière*, a wine in quality and value equal to Chambertin is grown. Many of these vineyards produce white wines as well as red. In the arrondissement of Beaune, the first commune is Vougeot, which produces the celebrated wine called *Clos Vougeot* (price 5 or 6 francs the bottle); also the *Esséjaux*, which is much esteemed, but less so than the Clos Vougeot. Further on is *Vosnes*, a village which produces the most exquisite wines that can be drank, uniting to richness of color the most delicate perfume, a racy flavor, fine aroma, and spirit. The most celebrated of these wines are the *Romanée St. Vivant* (so called from a monastery of that name), *Romanée-Conti*, the most perfect and best wine in *B.* (price 6 or 7 francs a bottle), *Richebourg*, and *La Tache*. About 3 m. from Vosnes is the small town of *Nuits*, near which are grown wines superior to those of Beaune for aroma, body, softness, and raciness, —among them the well-known *St. George's*, of exquisite flavor, delicious bouquet, and great delicacy. In the commune of Aloxe, a wine called *Corton* is grown, which is in repute for its bouquet, delicacy, and brilliant color. The ground from which this wine is made gives only 10 or 12 litres of wine each hectare, of which there are bnt 46. Bordering on Aloxe is the vineyard of *Beaune*, a well-known wine, of a very agreeable character. Not far from thence is produced the *Volnay*, a fine, delicate, light wine, with a taste of raspberry, and *Pomard*, of somewhat more body than Volnay, and therefore better calculated to keep, especially in warm climates. These are wines which, when genuine, bear a good character all over the world. Between Volnay and Meursault the vineyard of *Santenot* is situated, producing a celebrated white wine, called *Meursault*, and a red wine considered preferable to Volnay. The situation to the N.W. of Meursault is noted for the delicious white wine called *Mont-Rachet*, remarked for its fineness, lightness, bouquet, and exquisite delicacy, having spirit without too great dryness, and a luscious taste without cloying. It is deemed the most perfect white wine of *B.*, and even of France, rivalling Tokay itself in the opinion of many connoisseurs. This wine sells for about 1,200 francs the hectolitre. There are two vine grounds near, called the *Perrières* and *Clavoyon*, which produce white wines, sought after only from their vicinity to Mont-Rachet. *Chassayne*, not far from Puligny, is a productive vine land. The canton of *Morgeot* produces a red wine, much sought after. The village of *Santenay*, on the borders of the department terminating the elevated land, grows some choice wines, such as *Clos-Tavannes*, *Clos-Pitois*, and the *Gravières*, though not equal in quality to those already enumerated. The best time to bottle the choice wines of the Côte d'Or is the third or fourth year from the vat. Their prices differ greatly, and cannot be fixed. The "*têtes de cuvées*," or choice products in the best years, are never sold under 300 francs the hectolitre; the "*prémières cuvées*" in such seasons being 200 to 250 francs. When these wines have been kept for some years, they command a higher price. The longest duration of the finest wines most capable of keeping does not exceed 12 or 15 years from the season in which they are made. After that time, though they will support themselves some years, they decline instead of improve. From the second year in bottle, the fullest bodied and hardiest wines have attained their highest degree of perfection. All that can be desired after this period is, that they shall not deteriorate. — The department of the Yonne produces a vast variety of wines, some of which are of very good quality, but inferior to those of the Côte d'Or. The best known is the white wine of *Chablis*. If this wine is the product of a favorable year, it should be very white; it is a dry wine, diuretic, and its taste is flinty; it usually sells at about 100 francs the hectolitre. The vineyards of *Avallon* and of *Tonnerre* produce several delicate, fine, spiritnous, and good wines, which bring 100 francs the hectolitre. These wines will keep good in bottle from 5 to 10 years. — The department of the Saone et Loire produces wines which are by no means equal to those of the Côte d'Or or the Yonne, and they are therefore the *B.* of the less opulent classes. The arrondissement of *Macon* furnishes red wines of various qualities, which keep a good while in wood, and sell from 75 to 90 francs per hectolitre. The *Moulin-à-Vent* is a light and delicate species; but it must be drank in the second or third year: it will not keep beyond the tenth. The *Torins* and the *Fleury* have a fine and delicate taste; they please by their agreeable odor and aroma. The white wines of *Pouilly* rank superior to any of the red wines of the Mâconnais. Their characteristic is the nutty taste they leave on the palate. One year old they drink smooth and agreeable, after which they much resemble dry Madeira, both in color and strength. They will keep a long time. The white wine of *Fuissé* does not taste of the nut, like Pouilly, but has a flinty flavor, is fine and delicate. It becomes more spirituous by age.

The wine of *Beaujolais*, commonly but improperly classified among *B.* wines, is produced in the department of the Rhone. It is remarkable for the excellence of its color, for clearness, strength, and perfume. The best quality sells from 150 to 175 francs per hectolitre. It increases in value by age, augmenting a fourth in price every year it is kept.

The care taken of the *B.* wines by the maker is by no means equal to that taken of Champagne. Nature and the site, with the observance of a very simple and common process, are all that are demanded to bring to their present perfection the first red wines in the world. The secret of the excellence of *B.* depends upon unknown qualities in the soil, which are developed only in particular places, often in the same vineyard, in all events, within a very narrow district. Whatever be the cause, France has in these wines a just cause of boast, and a staple in which she will never be excelled.

Burin. See GRAVER.

Burlaps, a coarsely woven fabric of hemp, flax, or jute, usually 40 inches in width, used for bagging. It is manuf. in Maine, and is also imported from Dundee in pieces of about 180 yards. *Imp. duty*, 30 per cent.

Burlington, Cedar Rapids, and Northern R.R., runs from Burlington to Albert Lea, Minn., a distance of 252 m., including 11 m. from Manly Junction to Northwood, leased from the Central R.R. of Iowa, under a contract to run over that part of its road. This Co. owns and operates four branches; viz., Linn to Portville, 94 m.; Muscatine to Riverside, 31 m.; Vinton to Holland, 48 m.; and Elmira to Iowa City, 10 m. Total length of track, 435 m. This Co. also operates, under a lease (perpetual, with right of purchase), 12½ m. of the track of the Minneapolis & St. Louis R.R., extending from the State line to Albert Lea. The Co. was organized July 1, 1876.

The general offices are at Cedar Rapids, Iowa. Cap. stock (authorized), $10,000,000; (issued), $5,500,000. First mortgage 5% bonds, $6,500,000; Minneapolis & St. Louis R.R. 7% gold bonds (secured by first mortgage upon 12½ m. of railroad from State line to Albert Lea, guaranteed by B., C. R. & N. R.R. Co.), $150,000. The extensions on the Pacific Division from Traer to Holland 24½ m., and on the main line from Plymouth Junction to Manly Junction 5 m., and from Northwood to State line 4 m., total, 33½ m., are unencumbered, and have cost the Co. in cash $287,969.82, in addition to its guaranty upon $150,000 first mortgage bonds issued by the Minneapolis & St. Louis R.R. Co., or, in the aggregate, $437,969.82, to which should be added about $10,000 for improvements. Interests on bonds of this Co. are paid 1st June and Dec., in New York.

Burlington and Missouri R.R., runs from Plattsmouth to Kearney Junction, Neb., 190.14 m.; leased lines, 252.74 m.; total, 443.74 m. Offices at Omaha. Cap. stock (authorized), $12,000,000; (paid in), $8,537,800. *Funded Debt:* Convertible bonds unsecured, issued 1873, $600,000, payable 1883, interest 8% (Jan. and July); first mortgage convertible, issued 1869, $19,500, payable 1894, interest 8% (Jan. and July); consolidated mortgage, dated 1878, $6,729,000, payable 1908, interest 6% (Jan. and July); first mortgage O. & S. W., issued 1871, $1,034,000, payable 1896, interest 8% (Dec. and June). This Co. has a total land grant from the U. States of 2,451,212.48 acres. Of this there have been sold, up to 1879, 1,300,148.09 acres, at an average price of $7.47 per acre.

Burner, is that part of a lighting apparatus at which combustion takes place. See GAS-BURNER and LAMP-BURNER.

Burnettising, is one of the modes adopted for preventing timber from decay, invented by Sir Wm. Burnett. It consists of a strong solution of chloride of zinc, into which the timber is immersed. The same solution is applied to deodorize the bilge water which collects in ships' hulls.

Burning-Fluid. See CAMPHENE.

Burning-Glass, a small lens or mirror for concentrating the sun's rays to a focus.

Burnished, a term applied to articles polished and brightened by the use of the burnisher.

Burnisher, a bookbinder's tool, mounted with agate, blood-stone, or steel, for smoothing. It is also used by watchmakers.

Burnous, a cloak, or Arab wrapping, for the head.

Burnt Sugar. See CARAMEL.

Burr-Oak, the *Quercus macrocarpa*, a useful and ornamental tree of N. America; the wood is tough and close-grained, and more durable than the white oak.

Burtah, the salted and spiced flesh of the suleah fish (*Polynemus sele*), a piquant relish well known at the breakfast tables of Bengal.

Burthen, same as BURDEN.

Burton Ale, an ale of great strength, brewed at Burton-upon-Trent, England.

Bus, a London abbreviation for omnibus, a street carriage.

Bush, a circle or hollow cylinder of metal which lines the *box* or hollow of the nave of a wheel in which the axle works. — A similar circle let into other holes or orifices.

Bushel, the principal measure of capacity for corn and dry commodities in this country and in England. The imperial *B.*, which is employed in all English possessions, measures 2,218.192 cubic in., or 36.348 French litres. The Winchester *B.* (or old English standard corn *B.*), established by law in the U. States, is a cylindrical vessel, 18½ in. in diameter, and 8 in. deep inside, measuring 2,150.42 cubic in., or 35.237 litres; hence, 33 American *B.* equal 32 English *B.*, nearly. The standard measure furnished by the U. States government to the States, and adopted by statutes in New York and other States, is the half *B.*, measuring 1,075.21 cubic in. The New York statute provides "that the *B.* for coal, ashes, marl, Indian corn in the ear, fruits, and roots of every kind, and for all other commodities commonly sold by heap measure, shall be the half *B.*, and its multiples and subdivisions; and the measures used to measure such commodities shall be made cylindrical, with plain and even bottom, and shall be of the following diameters: From outside to outside the *B.*, 19½ in.; half *B.*, 15¾ in. All commodities sold by heap measure shall be duly heaped up in the form of a cone, the outside of the measure by which the same shall be measured to be the limit of the base of the cone, and such cone to be as high as the article will admit. Whenever wheat, rye, Indian corn, buckwheat, barley, oats, beans, pease, clover-seed, Timothy-seed, flaxseed, or potatoes shall be sold by the *B.*, and no special agreement be made by the parties as to the mode of measuring, the *B.* shall consist of 62 lbs. of beans, 60 lbs. of wheat, pease, clover-seed, or potatoes, 58 lbs. of Indian corn, 56 lbs. of rye, 55 lbs. of flaxseed, 48 lbs. of buckwheat or barley, 44 lbs. of Timothy-seed, and 32 lbs. of oats." The weight of *B.* for wheat is reckoned at 60 lbs. in almost all the States, but the weight of *B.* for other grains and commodities varies in the different States.

Bushire. See PERSIA.

Business, is a word extensively used in commercial language, for trade, profession, or calling, in which case it follows the term by which it is qualified; as, the produce *B.*, the wine *B.*, &c.; also, to qualify or characterize a trade or a transaction; as, wholesale *B.*, retail *B.*, prosperous *B.*, unsafe *B.*, I have made a good *B.*, etc. — *Business-like,* resembling *B.*, made in the proper way. — *Business Man,* one who thoroughly understands his *B.*, and conducts it as it should be. — *Business Tact,* aptness or readiness in transacting *B.* — *Business Way,* conducted or done in a business-like manner.

Business Hours, the time of the day during which *B.* is transacted; generally from 10 A.M. to 3 P.M. for banks and public offices, — which hours are also those during which principals of mercantile houses are expected to be found at their respective places of business. — In respect to the time of presentment and demand of bills or notes, *B. H.* generally range through the whole day, down to the hours of rest in the evening, except when the paper is payable at a bank or to a banker.

Busk [Fr. *busc*], a piece of flat whalebone, steel, or wooden supporter for the corset or stays of females.

Buss, the Dutch name for a large decked fishing lugger or cutter-built vessel.

Bussorah Gum, an Indian gum found in irregular white or yellow semi-transparent fragments, never very large. It makes a peculiar noise when chewed, and swells in water, but does not mix with it completely.

Bussu, a Brazilian name for a palm (*Manicaria saccifera*), which is applied to many useful purposes, — the large leaves for thatch, and the spathe for making durable cloth and ready-made bags.

Bust, a half-length statue; the representation of a person above the stomach.

Bustle, a lady's dress-pad.

Busuck, a small weight used in Borneo for gold and precious stones, the eighth part of a mace, and equal to 4.80 troy grains.

Busy, is a term denoting activity in trade; as, "the *busy* season."

Butcher, a slaughterer of beasts and vendor of flesh meat.

Butea-kino, a ruby-colored, astringent gum-resin obtained in India from the Dhak-tree (*Butea frondosa*), which affords a powerful and permanent dye.

But-Joint, a joint in which the pieces come square against each other, endwise. In iron-work the parts are welded, and the term is used in contradistinction to a lap-joint, or weld.

Butler, a family servant, who is intrusted with the charge of wines, etc.

Butler's Tray, a wooden tray for conveying articles to a dining-room.

Butt, the end of a plank. — A large cask of any kind. The English beer and wine butts contain 3 barrels, or 108 gallons. — In the leather trade, the tanned whole hide sole leather, from which the belly and shoulders have been cut off. See Butts.

Butter [Fr. *beurre;* Ger. *butter;* It. *burro;* Port. *manteiga;* Sp. *manteca*], a common name for all animal and vegetable solid oils and fats, but popularly applied to that from the milk of the cow, used for food.

B.-making. The amount of *B.* in cows' milk is about 4 per cent, though the kind of pasture, quantity of milk, and general condition, influence the relative quantity of the several ingredients of milk. In the extraction of *B.*, the milk is allowed to cool, and the cream, which rises to the surface, is skimmed off, and put into a large, deep, earthenware dish, where it lies for several days, till enough has been collected for a *churning.* In order to separate the *B.* from milk, recourse is always had to the process of agitation in a *Churn.* The principle involved in each and all of the forms of this apparatus is the thorough agitation of the contents, so as to cause the rupture of the minute fat globules present in the milk, and the incorporation or kneading of these ruptured fat globules into larger or smaller masses of *B.* The cream is strained through cloth into the churn, to remove any foreign matter; and the agitators being set in motion, the friction of the movement, combined with the admission of air and the chemical changes it induces, raises the temperature of the whole contents. At one time it was thought that one great object of the agitation was the admission of the oxygen of the air, which, becoming thoroughly incorporated with constituents of the milk, combined therewith, and, as a consequence, led to the separation of the *B.* It is found, however, that *B.* can be obtained from milk by mere agitation, without the admission of the oxygen of the air. At the same time, in the ordinary way of churning, oxygen does play a subordinate part, by combining with the sugar of the milk, and forming lactic acid, which, in its turn, *sours* the milk, and separates therefrom the caseine (cheese-matter) in minute clots or flakes, yielding what is commonly called *sour* or *butter milk.* The process of churning must be conducted at a medium rate. If too quickly performed, the *B.* is soft and frothy, and is said to be *burst;* whilst, when too slowly made, it is highly tenacious, strong tasted, and badly flavored. When all the *B.* has *come*, which is known by the particles agglutinating into irregular masses, the *B.* is *made* by taking the lumps and well washing and kneading them on a wooden board in a tub of pure spring-water till all the buttermilk has been expressed; it is then divided into the requisite size of lumps, fashioned into rolls, or moulded into forms, and usually stamped with some device. In the making up of the *B.*, the hands of the operator must be scrupulously clean, and be free from the slightest taint of soap. Persons who are subject to moist hands should never knead *B.*, as it is very liable to be contaminated by the slightest foreign matter, especially animal secretions; and it is better always for the operator to wash the hands with water containing some oatmeal before commencing. So important is this source of contamination regarded in this country, that every endeavor is made to get quit of manual labor in working the *B.*, and a wooden *butter-worker* has been invented, and is now largely used. When newly prepared, the *B.* is called *fresh* or *sweet B.*, and is of a yellow color, which is well known to be deeper as the pasture on which the cows have been fed is richer, and hence the poorer kinds of *B.* are often artificially colored with a little annotto, and rarely with the juice of carrots. A large quantity of the *B.* sent into market has more or less common salt added, for the purpose of preserving it. For use within a week or two, the proportion of common salt employed is about half an ounce to two pounds of *B.*, though, where it has to be kept for some time, as much as one ounce of salt to one pound of *B.* is used. The incorporation requires to be carefully and dexterously done, so that the resulting material may be uniform; and the better plan is, to add only a portion of the salt at a time, and to knead and re-knead the *B.* till the whole is thoroughly mixed. When the less amount of salt has been employed, the result is *powdered B.*, and the larger quantity yields *salt B.* Great care must be taken to have every vessel used in the preparation as clean or *sweet* as possible. Constant rinsings with cold water and scaldings with boiling water are resorted to. Attention must likewise be paid to the atmosphere of the apartments in which the milk is first placed, and in which the subsequent operations go on, as a tainted atmosphere always tends to injure the quality of the marketable commodity. The *adulterations* liable to be present in *B.* are an undue proportion of salt and water, and these run up occasionally to upwards of 33 per cent, or one third of the total weight. Another adulteration is the presence of lactate of zinc, derived from the milk being placed in zinc pails and basins, from the impression that by some imaginary electrical influence, an increase in the amount of cream will be the result; but though this is not attained, yet the milk tending to form lactic acid, the latter attacks the zinc vessel, and forms lactate of zinc, which dissolves in the milk, and thereby contaminates it, imparting an unpleasant taste, and, when present in larger quantity, leading to violent spasmodic vomiting. See Oleomargarine.

The annual product of *B.* in the U. States is about 550,000,000 lbs., more than one fifth of which is produced in the State of New York, chiefly in the counties of St. Lawrence, Delaware, Chenango, Chautauqua, which now rivals the best Dutchess County *B.*, long recognized as the highest standard of packed or salted commercial *B.* Orange County still retains its reputation for excellent *B.* Pennsylvania, Ohio, and several other Middle and Western States are also large producers. The *B.* known as *Philadelphia Print*, chiefly produced in Chester, Lancaster, and Delaware Counties, is unsurpassed for sweetness, solidity, and golden color. It always commands a fancy price. The quality of *B.* marketed in Cincinnati is constantly improving; and the quality known as *Creamery B.* sustains its price better than other kinds under a strong competitive demand from the Eastern cities. *B.* is generally put in tubs of about 50 lbs. each, or in kegs or firkins of from 56 to 110 lbs. The exports of *B.* in 1878 were 21,837,117 lbs.; value, $3,931,822, three quarters of which went to Great Britain and Colonies. *Imp.* duty, 4 cts. per lb.

Butter-Crock, an earthenware pan, mug, or jar for keeping salted butter. When filled, it weighs about half a cwt.

Butternut, Oil-Nut, or White Walnut, a species of walnut (*Juglans cinerea*), found in most parts of the U. States and in Canada. From its want of solidity, and from the difficulty of procuring pieces of considerable length, the timber of the *B.* is seldom used in the construction of houses. As it long resists the effects of heat and of moisture, it is esteemed for the posts and rails of rural fences. It is preferred to the red-flowering maple for wooden dishes, because it is lighter and less liable to split. It is also an excellent wood for the panels of carriages, not only from its lightness, but because it is not liable to split, and receives paint in a superior manner. The kernels of its hard, oblong nuts are very oily, very good to eat, and commonly served at table. The Indians formerly pounded and boiled them, and separating the oily substance which floated on the surface, mixed it with their food; hence the name. The bark of the *B.* makes a yellow dye.

Butter of Cacao, a concrete oil of most agreeable flavor, obtained by pressure from the seeds or chocolate beans of *Theobroma cacao*, and of which the nutritive properties of chocolate or cacao depends. One hundred parts of the seed yield from

60 to 80 parts of oil. It is largely used in the preparation of cosmetics, and also in pharmacy. *Imp.* free.

Butter of Canara, or Piney Tallow, a white, solid oil, obtained from the fruit of the *Vateria Indica*. It is used to make candles.

Butter-Print, a fancy turned wooden mould, for giving an ornamental appearance to butter-pats.

Butt-Hinges. See Butts.

Butt-Howel, a howelling-adze used by coopers.

Butting-Machine, a machine having planing-cutters on the face of a disk-wheel, and used for smoothing, cornering, or rounding the ends of joists or small timbers used in the frames of agricultural implements, etc.

Butting-Ring, in carriage-making, a collar on the axle, against which the hub butts, and which limits the inward movement of the wheel, as the linch-pin or axle-nut does the outward.

Butting-Saw, a cross-cut saw attached to a stock at one end, acting as does a drag-saw, and used for butting logs on the carriage of a saw-mill.

Buttock, in shipbuilding, the rounded-in, overhanging part on each side and in front of the rudder, terminating beneath by merging into the run.

Button, a projecting knob to fasten boots, articles of dress, etc *B.* are made of an endless variety of materials: Iron, steel, brass, copper, pewter, lead, gold, silver, horn, shell, pearl, tortoise-shell, ivory, bone, hoof, hair, silk, cotton, linen, gutta-percha, india-rubber, amber, velvet, cloth, Florentine, glass, porcelain, enamel, jet, compressed earth, clay, gems, precious stones, etc. As examples of two wholly distinct classes of *B*, the *gilt* and the *covered* will suffice to give a general idea of the manufacture. — *Gilt B.*, a kind of brass (copper with a little zinc) is the metal of which these buttons are usually made. The metal is rolled into thin sheets, cut into narrow strips, and stamped out into disks or blanks by the action of a fly-press. Each blank is rolled between two steel bars, to smooth and round the edge. It is then *planished*, or levelled on the surface, by smart blows from a steel hammer. The shanks are made of brass wire; a machine cuts off a small piece, bends it into a kind of eye, and flattens or spreads out the two ends. One of these shanks is soldered to each blank by the aid of a little simple mechanism. If the button is to have a plain face, the maker's name, &c., are stamped on the back by means of a die; but if the face is also to be embossed, a die and counter-die are used, so as to stamp both surfaces at once. The *B.* are scoured in a weak solution of aquafortis, washed, and dried, and then covered with a thin layer of gold. (See Gilding.) If the gold is only applied to the face, the *B.* are known as *tops;* but if to the back as well as to the face, they become *all-overs*. The layer of gold is so excessively thin that 3 grains are sometimes made to cover a gross of *B.*; and yet each *B.* admits of being well burnished with an agate or bloodstone burnisher. — *Covered B.* A metal *shell* is stamped out of a piece of thin sheet-iron; a metal *collet*, or smaller disk, with a hole for the shank, is similarly stamped out; a circular piece of silk, satin, Florentine, twill, mohair, cloth, or other textile material, is stamped out; a circular padding is made of soft paper, silk, and thread; and then all these pieces are brought together in a wonderfully quick and effective way, by the aid of a peculiar die, a stamping-press, and certain punches and hollow tools. The shank, protruding through the hole in the collet, is not an eye of metal, but a tuft of soft material through which a needle and thread can be passed. The padding fills up the space between the metal face and the metal back. It would be impossible even to enumerate all the processes employed in this manufacture. Almost every manipulation known in the arts is rendered available by the *B.* makers, according to the substances employed, — casting, stamping, tracing, embossing, drilling, piercing, carving, welding, soldering, grinding, smoothing, burnishing, gilding, silvering, tinning, plating, electro-plating, japanning, chasing, engraving, all are brought into requisition. *B.* of several kinds are made in New York; but the most extensive *B.* manufactories in America are at Newark, N. J., Waterbury, Conn., Springfield and East Hampton, Mass. The value of *B.* imported to the U. States in 1878 was $3,362,085, on which Germany contributed $1,683,790; France, $1,136,392; and England, $514,016.

Imp. duty: Barrel *B.*, or *B.* of other forms, for tassels or ornaments, made in whole or part of wool, worsted, or mohair, 50 cts. per lb., and 50 per cent.

B., convex-linen, so called, made of linen and brass (brass chief value), 30 per cent.

B., cuff and sleeve, glass, 40 per cent.

B., cuff and sleeve, if not jewelry, dutiable according to material, as personal ornaments, without reduction.

B., cuff and sleeve, mother-of-pearl, 35 per cent.

Iron *B.*, not cuff or sleeve, 30 per cent.

B. of lastings, mohair, cloth, silk, twist, linen canvas, or other manuf of cloth, woven or made in patterns of such size, shape, and form, or cut in such manner, as to be fit for *B.* exclusively, not combined with india-rubber, 10 per cent.

B of silk, or silk component of chief value, containing no wool, worsted, or goats' hair, 50 per cent.

B. of vegetable ivory, 30 per cent.

Button-hole Cutter, a special kind of shears for cutting button-holes. There are several contrivances of the kind, chiefly differing in their means for adjusting the length of the cut, and its angle with the edge of the cloth.

Button-Hook, a curved metal loop for fastening the buttons on boots, gaiters, etc.

Button-Lathe, is a machine for cutting round disks for buttons, from plates of bone, ivory, wood, mother-of-pearl, etc.

Button-Mould, is a disk of bone, wood, or metal, to be covered with fabric to form a button.

Button Rivetting-Machine, a tool for fastening buttons to garments by swaging down on the back of the washer the end of the rivet which forms the shank of the button.

Button-Wood, Plane-Tree, or Sycamore, is a large forest-tree of North America, the *Platanus occidentalis*. Its wood, in seasoning, becomes of a dull red; its grain is fine and close, and it is susceptible of a brighter polish than the wood of the beech, to which it bears some resemblance. Its concentric circles are divided into numerous sections, by fine medullary rays extending from the centre to the circumference. Cabinet-makers seldom make use of this wood, on account of its liability to warp, except for bedsteads, which retain the color of the wood, and are coated with varnish. This wood speedily decays when exposed to the atmosphere, hence it is only proper for work that is sheltered from the weather. It is used for musical instruments.

Butts, or Butt-Hinges, are hinges for doors, formed of two plates and interlocking projecting pieces, which are connected by a pintle. They are so called from the leaves being secured to the door and casing at points which abut upon each other. The varieties known in the trade are the *broad*, *narrow*, *loose-joint*, *reversible*, *shutter*, *wrought*,

table, *fast-joint*, *acorn-tipped*, *congress*, and *spring butts*.

The *Geer's Double-Action Spring Butt* (Fig. 48), patented in 1877, and manuf at Unionville, Conn., combines the toggle arm with a spiral spring, which gives out from 60 to 80 per cent more force at the closing joint than when wide open, and *vice versa*, the spring acts with less resistance the wider the door is opened. It allows the door to be opened clear back to the wall, and the spring retains it there; thus the toggle and spring fill two important offices, — that of holding the door closed and also open.

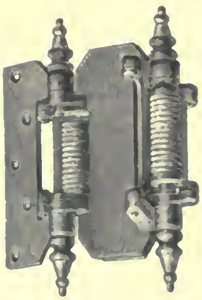


Fig. 48. — Geer's Double-Action Spring Butt.

Butyraceous, having the qualities of or resembling butter.

Buyer, a purchaser. In large importing and jobbing houses, the purchase of goods is the special department of one of the partners, or of a clerk, termed the buyer.

Buying and Selling, sale or exchange; the transmission of property from one person to another, in consideration of some price or recompense in value. If the transfer is for money, it is a sale.

Byapar, or Byohar, in Hindustani, business affairs, a trade or calling; also a loan, hence *byohara* is a creditor or lender.

By-Laws, are regulations of any kind, enacted, adopted, and agreed upon for the better governance of certain trades, corporations, or joint-stock associations. The power to make by-laws is usually conferred by express terms of the charter creating a corporation; though, when not expressly granted, it is given by implication, and it is incidental to the very existence of a corporation. In some instances, by-laws have to be legally registered or published, in order to be binding.

Byssus, a viscid, silky fibre produced by the wing-shell mollusk (*Pinna augusta*) of the Mediterranean and Atlantic seas. The filaments are extremely fine and strong, and often reach 3 feet in length. The color, which is a reddish brown, never fades. Stockings, gloves, and other articles have been woven of it, but more as a curiosity than for use.

C

C, a Roman numeral, representing one hundred; CC, two hundred. — A French abbreviation for *compte*, account; CC, *compte courant*, account current.

Cab, an abbreviation for cabriolet, is a light, two-wheeled English street carriage, with the driver perched on an elevated seat behind, and called a Hansom cab, from the name of the first patentee. There are now 10,000 in London. — The covered part in front of a locomotive which protects the engineer and fireman, and shields the levers, etc.

Cabal, a luscious beverage or rich raisin wine made in Portugal.

Caballine, anything belonging to a horse; hence coarse aloes, used in veterinary medicine, are called caballine aloes.

Caban, an Eastern measure of capacity. In the Philippines, the caban of rice weighs 133 lbs. avoirdupois, and of cocoa, 83½ lbs. — A French cloak, with a cape.

Cabaret, a French tavern, or tippling and smoking house.

Cabaza, a large Spanish cloak.

Cabbage, the *Brassica oleracea*, a well-known pot-herb, of which there are many cultivated culinary varieties, used in a boiled state, salted, or pickled. It is extensively cultivated in the U. States. See SAUER-KRAUT.

Cabbage-Lettuce, a species of lettuce, with leaves forming a low, full head, like the cabbage.

Cabbage-Net, a small net made of twine to hold vegetables in a pot.

Cabbage-Palm, the *Oreodona oleracea*, one of the loftiest of all palms. Its brittle flakes or young shoots form an esteemed esculent in the West Indies. The wood is sometimes used for ornamental furniture; but it does not answer very well, as the ends of the fibres are too hard, and the medullary part too soft for holding glue; the surface is also very difficult to polish, and cannot be preserved without varnish.

Cabbling, a process in iron-making, which consists in breaking up the flat masses of iron into pieces, to be again heated in a furnace, and wrought or hammered into bar-iron.

Cabeca, the Portuguese name for the finest kinds of silk received from India, as distinguished from the *bariga*, or inferior kind.

Cabestrillo, a Spanish neck-chain of gold or silver.

Cabin, an apartment or room in a ship apportioned to an officer, or to passengers.

Cabinet, a small closet or room. — A set of drawers to hold curiosities. — The French name for a private office.

Cabinet-File, a smooth, single-cut file, used by furniture-makers and joiners.

Cabinet-Making, comprises the more delicate kinds of working in wood, applicable to mahogany, rosewood, maple, walnut, satinwood, and other ornamental woods.

Cabinet-Organ, a superior class and size of reed organ.

Cabinet-Picture, a small-sized and valuable painting.

Cabinet-Woods, ornamental woods suited for the purposes of the cabinet-maker.

Cabin Furniture, light, compact, and folding articles, for the convenience of a passenger at sea, and occupying little space.

Cabin Passenger, a voyager at sea who has the best accommodation the ship affords; in contradistinction to the steerage and intermediate passengers.

Cable, a strong rope, chain, or cluster of wires, designed for holding a ship at anchor, for supporting the roadway of a suspension bridge, for moving, warping, and other purposes. Ship's *C.* are made of hemp, manilla, or cord, or of iron links. The regulations of Lloyd's require all vessels under 150 tons to have at least 150 fathoms of chain *C.*; those of 250 to 350 tons, 200 do.; of 350 and under 500 tons, 240 do.; of 500 and under 700 tons, 270 do.; those of 700 tons and upwards, 300 do.; but in all cases where hempen *C.* are used, then one sixth more in length is required. *C.* are of various sizes, from 1 to 18 inches in circumference; below 10 inches in circumference, a rope is called a *hawser*. A *stream C.* is a hawser for mooring. A rope *C.* is always composed of three strands, every strand of three ropes, and every rope of three twists, the twist is, however, made of more or less threads, according as the *C.* is to be thicker or thinner. A rope 2 inches in circumference, and 120 fathoms long, is generally found to weigh nearly 1 cwt. *C.* are now more generally formed of iron chains, which are much stronger and more durable than those of hemp. On a rocky bottom, a hempen *C.* is destroyed in a very short time, while the duration of the other is almost indefinite. It is sometimes desirable to cut the *C.* when of hemp; this contingency is provided for in iron *C.* by a bolt and shackle at short distances, so that by striking out the bolt the *C.* is easily detached. A chain *C.* is not simply a chain, for it has a cast-iron strengthening stay-piece across each link, or each alternate link. Nearly the whole mass is made by forging and welding, including the links themselves, as well as the shackles, swivels, and other parts. A chain *C.* made of 2¼ inch rod-iron weighs 272 lbs. per fathom. — *C.* for supporting *suspension bridges* are made of separately stretched steel wires, each of which is brought to a certain strain, and the bunch bound up into a *C.*, wrapped, parcelled, and then served with wire and painted. — *Submarine C.* for telegraphic purposes have an interior core of copper wire surrounded by wires twisted after the manner of a rope, the whole being protected by a non-conducting waterproof coating of gutta-percha or india-rubber. *Imp.* duty, (chain) 2½ cts. per lb., (rope) see CORDAGE.

Nautical terms: To *bit* the *C.*, is to wind it around the bitts. — To *buoy* the *C.*, is to support it by floats which keep it clear of the ground in a rocky anchorage. — To *coil* the *C.*, is to dispose it in helical tiers. — To *drag* the *C.*, is to haul it in the wake of the vessel. — To *fleet* the *C.*, is to allow it to surge back on the whelps of the capstan or windlass, as the cable climbs on to the larger part of the cone. — To *heave* the *C.*, is to haul in aboard. — A *kink* is a short turn in a *C.* which prevents its running through the hawse-hole. To *nip* the *C.*, is to stop the running out by a pinching-rope, clamp, or lever. — A *C.* is *parcelled*, when wrapped with tarred canvas. — To *pay out*, is to allow the *C.* to run out. — To *serve* the *C.*, is to wrap it with ropes to keep it from being chafed. — To *slip* the *C.*, is to let it run clear out, thus losing the *C.* — *Spliced* is said of two *C.*, or two portions of a *C.*, united by working the yarns or strands of the two portions together. — To *stopper* the *C.*, to fasten it to the bitts. — To *unbend* the *C.*, to detach it from the anchor. — To *underrun* the *C.*, is, with hempen hawsers, to take on board on one side of a boat and pay out on the other, examining and cleansing. — To *veer* a *C.*, is to allow it to run out, keeping command over it. — *Wormed* is said of a *C.* which has the spiral crevices between the lays filled with strands; usually a preliminary to serving.

Cable-Laid, anything twisted after the manner of a cable; thus there are cable-pattern gold chains, etc.

Cable's Length, a maritime measurement, ordinarily signifying 120 fathoms, or 240 yards; but the usual length of a ship's cable is only about 75 fathoms.

Cable-Tier, the space on the orlop deck or in the hold of a ship, where the cables are stored.

Cable-Tow, a small stream cable.

Cabochon, the French name for a precious stone, polished, but not cut.

Caboose, a house on deck of a ship where the cooking is done; a ship's fire-hearth, or stove, fitted with boilers, ovens, etc., for cooking meals for those on board; also termed a galley.

Cabot, a dry measure in general use in the island of Jersey, 19 of which are computed equal to 1 quarter of wheat, and 11 to a quarter of barley.

Cabotage, the French name for the coasting trade. *Petit cabotage* is applied to coasting voyages carried on in small vessels below 70 tons, between ports not far distant from each other; *grand cabotage*, to coasting voyages to distant ports of Europe.

Cabotier, a French coasting vessel.

Cabrino, the Spanish name for goat-skin.

Cabriolet, a carriage drawn by one horse, with a calash cover, and an apron or covering in front. See Cab.

Cabritilla, the Spanish name for a tanned or dressed lamb or sheep skin.

Cabron, the French name for a kid skin.

Cabrouet, a sort of cart used in sugar plantations.

Caburns, small lashings for binding a cable.

Cacao [Fr., Sp., Port., and It. *cacao;* Ger. *kakao*], the seeds or nuts of *Theobroma cacao*, the cacao or chocolate tree (Fig. 49). The pod resembles a cucumber in form, and contains from 20

Fig. 49. — Cacao Tree.

to 30 oval nuts, about as large as an olive, and covered with a violet or ash-gray skin, which encloses two cotyledons of a fatty nature, and of a brownish-black or violet color, which are very nutritious. These dried kernels, beans, or seeds are imported from the West Indies, Central America, and Brazil, in all which countries the tree grows wild, or is cultivated for the sake of its seeds. These seeds contain from 60 to 80 per cent of their weight of fat or oil, called *butter of cacao* (q. v.). In commerce, they are improperly called *cocoa*. After being picked, roasted, shaken, crushed, and winnowed, they constitute *cocoa nibs;* and a kind of rind or husk, which is separated from them, finds a sale as an inferior kind of cocoa. In another form, the crushed nuts are heated, and ground into a paste, to which other substances are added, to enable water to mix with the fat or butter of the cacao. These additions are one or more along a large list, — sugar, honey, treacle, gum, starch, oatmeal, flour, rice, potato starch, nut meal, almond meal, arrowroot, together with spices and perfume. Mixing, heating, and casting in moulds are the processes adopted. The product is called *chocolate* if it requires boiling and stirring to dissolve, and *soluble chocolate* if it easily dissolves. By a change in the added ingredients, *chocolate paste* is produced. The plain *cocoa* of commerce is an inferior chocolate, containing some of the husk as well as the nut, and increased in bulk by treacle, flour, rice, or other ingredients cheaper than the nut. *Flake cocoa* is nearly the same as cocoa in powder, except in being condensed into flakes by passing through mills. The purest form of all is *cocoa nibs*. *Imp.* duty (nuts), free; (prepared or manuf.), 2 cts. per lb.

Cacao-Butter. See Butter of Cacao.

Cachaguyo, the name in Chili for the *Durvillea utilis*, a sea-weed which is sold in bundles as an edible vegetable.

Cachalot, the sperm whale (*Physeter macrocephalus*), chiefly found in the South seas. It furnishes a fine oil and spermaceti, and hence the fishing for it is an object of commercial importance.

Cacharado, a kind of Spanish linen.

Cacholong, a milk-white variety of opal, first discovered on the banks of the river Cash, in Bokharax, but also found in the trap-rocks of Iceland and other Northern countries.

Cachunde, a paste flavored with musk and other aromatics in Spain.

Caciocavalli, a kind of Italian cheese.

Cacoon, a name for the seeds of *Entada gigalobium*, which are used for making purses, scent-bottles, etc.

Cactine, the red coloring matter obtained from some species of the cactus group of plants.

Cactus, a common name for a large group of succulent plants belonging to several genera, most of which are curious and handsome, but of little use except as fences in tropical countries. *Opuntia cochinillifera* is, however, of importance, as on it are reared the cochineal insects. The fruit is not much esteemed as an edible, but it is used for feeding pigs in many quarters, and has also been turned to some account in producing alcohol.

Cadafaes, a Lisbon white wine.

Cadarzo, a name in Spain for coarse silk, which cannot be spun with a wheel.

Caddy, is a small tea-chest, or box, for table use.

Cade, a keg, or small barrel; also, a variable fish measure: 500 herrings or 1,000 sprats make a cade.

Cade-Oil, an empyreumatic oil, obtained by distillation in a retort from the wood of *Juniperus oxycedrus*. It is used in veterinary medicine.

Cadiz. See Spain.

Cadjara, a silk horse-cloth, or trapping, used in Russia.

Cadmia, the crust deposited on furnaces in which zinc ore is sublimed, containing from 10 to 20 per cent of cadmium.

Cadmium, a beautiful white metal, which in color and lustre has a strong resemblance to tin, but is somewhat harder and more tenacious. It is very ductile and malleable. Sp. gr., 8.604; average cost in New York, 20 cts. per oz. *Imp.* free.

Cadmium Yellow, the commercial name for the sulphide of cadmium, an artist's paint, the

finest and most permanent of all the yellow pigments in use.

Café, the French name for coffee; also, for coffee-house.

Cafeine, a trade name for a mixture of roasted grain and chicory ground, sold for coffee.

Caffeine, the active, nitrogenous principle giving the flavor to coffee, and which is similar to theine in tea.

Caffir Corn, a variety of *sorghum*, cultivated in parts of Southern Africa for its seeds.

Caftan, a thick quilted cloak or robe of wool or silk, used in Arabia and Turkey.

Cag. Same as KEG (q. v.).

Cage, a basket or enclosed frame for ascending and descending coal-mines. — A prison for birds. — *Cage of a whim*, is a mining name for the barrel on which the rope is wound up.

Cagliari. See SARDINIA.

Cagmay, an opprobrious term applied to bad meat or poultry.

Cahan, a nominal East Indian currency, which is the fourth part of a rupee.

Cahier, a number of sheets of paper tied loosely together. In the French paper-trade, a *C.* is a parcel of 5 or 6 sheets, the fourth or fifth of a quire

Cahiz, plural CAHICES, a variable dry measure in Spain. The standard cahiz of 12 fanegas used in Cadiz and other places is rather more than 18 bushels, and in Valencia 100 cahices are equal to 70½ quarters. In some districts of Spain the cahiz is only 5 to 5½ bushels.

Cahizada, a superficial measure of Spain, consisting of 6 fanegadas, and equal to 1 acre (8 perches). What is generally understood by a *C.*, is the extent of land that can be sown with a cahiz of grain.

Cahors Wine, a red wine manuf. in the district of Cahors, a city in the S.W. of France. The grapes are plucked from the stems. After they have been well trodden, the murk or skins of the grapes are either partly or wholly set over the fire in large boilers, and boiled for some time. After this, the contents are poured into a vat with the other part of the juice which has not undergone the same operation. They commonly remain 8 or 10 days in the vat, when they are racked. They do not usually press the murk. These wines are most commonly treated by mixing them with one third of a liquor called *rojome*, which is the must of the *auxerrois* grape, made to boil for 5 or 6 minutes. They afterwards throw into it the highest proof spirit of wine, in the proportion of 1 gallon to 4 of the must, and it is then put in the cask. It is racked at the expiration of 2 or 3 months. Much of this liquor is sent to Bordeaux, to strengthen or color light wines. The *C. W.* carries little perfume, but it is strong in body. It is bottled at 2 or 3 years old. It will keep 20 or 30 years in wood, and 40 or 50 in bottle. In commerce, it increases 10 per cent in value each year it is kept. The best wines are grown on the hills, and in the communes of St. Géry, Vers, Savangac, and Cahors. The price at Cahors is about 100 francs the hectolitre.

Cahoun, or COHUNE, a plume-like palm, *Attalea cohune*, native of Honduras, bearing nuts, which grow in clusters like a bunch of grapes; an oil is obtained from them by expression, equal to that from the cocoa-nut.

Caico, a small Italian skiff; a jolly-boat.

Caigue, a light bark used on the Bosphorus.

Caimehs, the Turkish name for the much-depreciated paper currency of the Sultan.

Cairngorm, a variety of rock-crystal of various shades found on the mountain of that name in Inverness-shire, Scotland, and of which seals, necklaces, and other trinkets are made.

Cairo. See EGYPT.

Cairo and St. Louis R.R., runs from Cairo to East St. Louis, Illinois, 146.5. m. Offices in St. Louis. This Co. was chartered in 1865, and the road was completed in 1875. Cap. stock, $4,565,-000; funded debt, $2,500,000; total, $7,065,000. The Co. first made default on its bonds in 1874. The funded debt consists of a first mortgage 7% bonds, issued 1871, payable 1901. Net earnings for 1878, $21,950.98.

Caisson, a water-tight box for facilitating the commencement of the foundation of piers, bridges, etc. — A machine for raising vessels, resembling an enormous chest, with an air-tight chamber in the interior, which will not allow it to sink beyond a certain depth. In order to raise the vessel, it is sunk by letting the water into it, and brought under the ship's bottom, and there secured. The holes through which the water entered are then closed, and the water pumped out. This causes it to rise and lift the vessel, bringing the bottom out of the water for inspection and repairs, which can be thus effected without bringing the vessel into dock, or hauling her on shore.

Cajeput, an essential oil, limpid, transparent, of a greenish color, a camphoraceous smell, and an acridly aromatic taste. Sp. gr. 0.927. It is sometimes adulterated with other oils, particularly oil of turpentine. It is prepared in large quantities in the Dutch settlements of the Banda and Molucca islands, from the leaves of the *Melaleuca cajeputi*, and is imported by way of Holland, in copper flasks. It is used internally as a stimulant and antispasmodic, but more frequently externally as an embrocation. *Imp.* free.

Cajon, or CAXON, the Spanish name for a chest. In the South American mining districts it is applied to a weight of 50 quintals of mineral.

Cake, a kneaded or solid mass of any kind, as a cake of copper, of Indian ink, of pastry or baked dough, etc.

Cake-Breaker, a crushing or cutting implement for breaking up oil-cake for the feeding of stock, and pressing rape-cake for manure.

Cake-Toaster, a toasting-fork.

Calabash, [Sp. *calabaça*], a name given in the West Indies to a gourd or pompion, the fruit of the *Crescentia cujete*, which when young are pickled. The hard rind or covering, when the pulp has been taken out, is made into all kinds of domestic utensils by the negroes, — cups and saucers, baskets and bowls, pepper and salt dishes, etc., — which take the place of crockery, and are not so easily broken or destroyed. Many will stand the fire for cooking as well as an iron pot.

Calabazate, in Spain, pumpkins preserved in sugar, or steeped in honey.

Calabria Wine. See ITALIAN WINES.

Calais. See FRANCE.

Calamanco, a glossy, woollen stuff, checkered in the warp, either ribbed or plain, manuf. in Bradford, England.

Calamander Wood, a beautiful fancy wood obtained from *Diospyrus hirsuta*, a tree which grows in Ceylon. It is extremely hard, and finely veined with different shades of black and brown. It is scarce, and very dear.

Calambour, a kind of eagle or aloes wood, sometimes used for inlaying and cabinet-work.

Calamine, a native carbonate of zinc, used as a drug.

Calamus Oil, an oil obtained from the root of the sweet flag, *Acorus calamus.* It is used in pharmacy and perfumery.

Calavance, a name for several kinds of pulse, including the *Dolichos Barbadensis* and *sinensis.*

Calcar, a calcining furnace in glass-works.

Calcareous Earth, a gritty soil which contains a large percentage of lime.

Calculator, one who reckons or estimates matters of figures or detail.

Calcutta. See INDIA (BRITISH).

Caldron, a large iron boiler or pot.

Caleche, or CALASH, a lady's hood. — A small hooded carriage running on low wheels.

Calendar, a register of times and seasons; an almanac. The principal measures of time are those

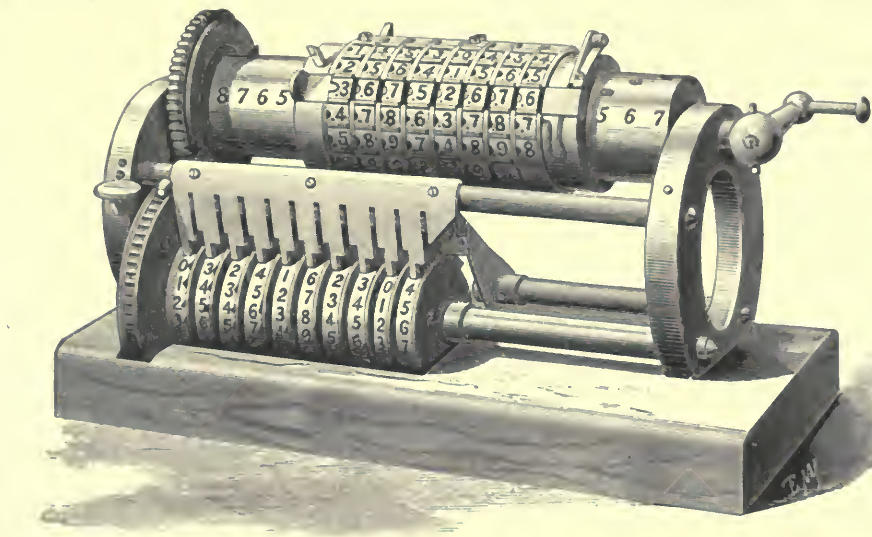


Fig. 50. — CALCULATING MACHINE.

Calcareous Spar, a carbonate of lime.

Calcedony. See CHALCEDONY.

Calcination, the reduction of substances to cinders or ash.

Calcium, the metallic base of lime. See LIME.

Calculating Machine, an instrument with toothed wheels, each turning freely on its own centre, for automaton calculation. The forms which some of these machines have assumed, and the work which they have effected, are truly wonderful. Thomas's *Arithmometer*, Babbage's *Difference Engine*, the same remarkable man's *Analytical Engine*, and Scheutz's *Calculating Machine*, are, with the following, the principal specimens hitherto produced.

The Arithmometer, invented by Mr. George B. Grant of Boston (Fig. 50), is a calculating machine for common operations in multiplication and division. It is about 7 inches in height, and covers 5½ by 13 inches on its base. Its works are of metal, and all striking and wearing parts are of tempered steel. "It works with rapidity and certainty, is composed of a comparatively small number of parts, is substantially constructed, not readily disarranged, and easily operated, effecting a saving in time of more than sixty per cent over ordinary methods, and relieving the mind from any strain, as well as removing all doubt of accuracy" (*Report of the Committee of the Franklin Institute*, Oct. 19, 1876). Example of multiplication: 367 × 493. Set up 367 on the three upper adding rings on the sliding carriage, and turn three times. Shift the slide one point on the cylinder, and turn nine times; another shift, and four turns will complete the operation, and show the result, 180,931, in plain figures on the recording wheels on the lower shaft.

furnished by nature in the rotation of the earth on its axes, the revolution of the moon round the earth, and the revolution of the earth round the sun, — periods respectively denoted by the terms Day, Month, and Year. For ordinary purposes, however, they are reckoned by approximate or conventional methods. The Civil Day is the *mean* solar day. The Lunar Month is, except in Eastern countries, superseded by the Calendar month. The Civil Year, or mean solar year, was adjusted by Julius Cæsar (B.C. 45), who, estimating the solar revolution at 365 days, 6 hours, fixed that the year should consist of 365 days in three successive years, and 366 in the fourth, called leap year. This method, denominated *Old*

GENERAL CALENDAR FROM 1798 TO 1899.

YEARS							MONTHS.	SUNDAYS.						
G	F	E	D	C	B	A		1 8 15 22 29	2 9 16 23 30	3 10 17 24 31	4 11 18 25	5 12 19 26	6 13 20 27	7 14 21 28
1798	1799	1800	1801	1802	1803									
1804	1805	1806	1807		1808	1809								
1810	1811		1812	1813	1814	1815								
	1816	1817	1818	1819		1820								
1821	1822	1823		1824	1825	1826	January, October	A	B	C	D	E	F	G
1827		1828	1829	1830	1831									
1832	1833	1834	1835		1836	1837	May	B	C	D	E	F	G	A
1838	1839		1840	1841	1842	1843	August, February (*leap year*)	C	D	E	F	G	A	B
	1844	1845	1846	1847		1848								
1849	1850	1851		1852	1853	1854	February, March, November	D	E	F	G	A	B	C
1855		1856	1857	1858	1859									
1860	1861	1862	1863		1864	1865								
1866	1867		1868	1869	1870	1871	June	E	F	G	A	B	C	D
	1872	1873	1874	1875		1876	September, December	F	G	A	B	C	D	E
1877	1878	1879		1880	1881	1882								
1883		1884	1885	1886	1887		January (*leap year*), April, July	G	A	B	C	D	E	F
1888	1889	1890	1891		1892	1893								
1894	1895		1896	1897	1898	1899								

Use. — To find the day of the week answering to May 4, 1840. — Above 1840, in the left-hand table, is found the *Dominical* or *Sunday Letter* D, and over D, contiguous to May, in the right-hand table, is the figure 3, the date of Sunday; the 4th, therefore, is Monday.

The converse of this operation, namely, to find the day of the month corresponding to the day of the week, is too evident to require illustration.

The months January and February, it will be observed, are to be referred to separately in leap years; such years may be known by a blank space always preceding them in the left-hand table.

Style, was adopted and continued by all Christian nations until A.D. 1582, when it was discovered that the Julian year was too long by about 11 minutes, — the true length of the solar year being 365 days, 5 hours, 49 minutes nearly. To rectify this error, which had then led to an advance of about 10 days, Pope Gregory XIII. ordained that the year 1582 should consist of 365 days only; and, to prevent a like irregularity in future, it was decreed that when a number denoting a complete century is not divisible by 4, as the 17th, 18th, and 19th, such years should be reckoned as common years, — an arrangement involving an excess of but 1 day in 5,200 years. The Gregorian Calendar, or *New Style*, was gradually adopted in all Christian countries, except those which acknowledge the Greek Church, — Russia and Greece. In England, it was adopted in 1752, when the difference of time being 11 days, it was enacted that the 3d of September of that year should be called the

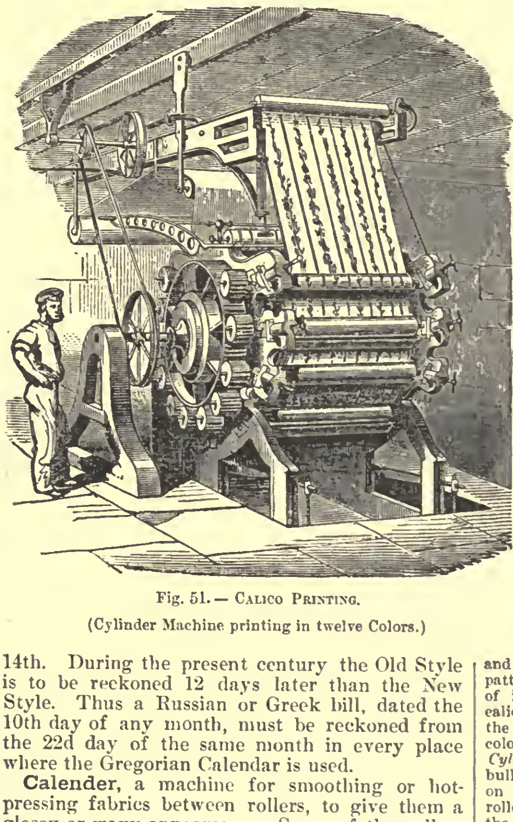


Fig. 51. — CALICO PRINTING.

(Cylinder Machine printing in twelve Colors.)

14th. During the present century the Old Style is to be reckoned 12 days later than the New Style. Thus a Russian or Greek bill, dated the 10th day of any month, must be reckoned from the 22d day of the same month in every place where the Gregorian Calendar is used.

Calender, a machine for smoothing or hot-pressing fabrics between rollers, to give them a glossy or wavy appearance. Some of the rollers are indented or embossed, to produce *watered* or *figured* patterns at the same time as the pressing. Some of them are heated from within, some are used cold, according to the fabric. A more simple and well-known *C.* is described under MANGLE.

Calf, the young of a cow, usually so termed until it is past six months old, when it becomes a yearling. *C.* generally become fat enough for veal in 8 or 9 weeks. — The name given to calf-skins prepared for book-binding, etc.

Calfini, a preparation made with the oil distilled from the outer bark of the birch, and used for flavoring Bavarian beer.

Calf-Skin, the hide of the calf, which, when tanned, forms the material for one of the most valuable kinds of leather. *C.-S.* for boot-makers are extensively manuf. in the U. States, but the best come from France. *Imp.* duty (tanned, or tanned and dressed), 25 per cent.

Calibre, a French word now generally adopted to express the bore of a piece of ordnance.

Caliche, a name for nitrate of soda found in Peru.

Calico, a general term in Europe for any plain white cloth made from cotton, but which receives peculiar distinctive names as it improves in quality and strength, and according to the purposes for which it is used. In the U. States the term is restricted to printed cotton cloths. See COTTON MANUFACTURE.

CALICO PRINTING [Fr. *impression d'indiennes;* Ger. *kathendruckerei*], is the art of producing figured patterns upon cotton cloths. It comprises mechanical and chemical processes which require much skill, and has been practised in India and China for many ages, the word "calico" itself being derived from Calicut, on the Malabar coast, whence printed goods were first imported. The dyes and colors are of two kinds, — those which penetrate through the whole substance, showing almost as brightly on one surface as on the other; and those which are intended to be seen only on one side. They comprise nearly the same series of animal, vegetable, and mineral substances as the dyer is in the habit of using; but there are additional precautions necessary to insure *fast* colors. — *Color Mixing.* The color-house at a print-work is an important place, in which a considerable knowledge of chemistry must be displayed. The mills and stones for grinding, the rotating machines for mixing, and the caldrons and boilers for heating, partake of the usual mechanical character; but there is much else to attend to in relation to the qualities of the various dyes and colors. Some must be thickened with starch, or flour, or gum, to make them act more like a paint than a dye; some have the mordant combined with the colors, instead of being used separately; some require a liquid vehicle that would be inappropriate for others; some require steam to act upon them after they have been applied to the cloth. — *Block-Printing.* In the early days of cotton-printing, the pattern or device was engraved on the surface of a large square block of sycamore, holly, or pear wood; and this plan is still adopted for choice patterns of which only a small supply is likely to be needed. The pattern may be engraved on any kind of smooth wood, or may be built up in relief with narrow slips of copper, or may be reproduced by electrotype. The color is spread out on a cushion or pad; the block, held by a handle at the back, takes up a thin layer of it; this layer is applied to the cloth, smoothly spread out on a table, and so on. If the pattern comprises many colors, there is one block to each; and the blocks are used in regular succession, each filling up its proper place in the design. The cloth is shifted on as fast as it is printed, and a new portion brought forward at each shifting. — *Perrotine-Printing.* A machine for block-printing, called the *Perrotine*, is used in France and Belgium. Three long wooden blocks, engraved with the pattern, are made to fit upon three sides of a square prism of iron. The prism rotates upon a horizontal axis; the calico or muslin passes between the prism and the bed; and the action is such that the calico receives a long stripe of colored pattern every time it touches one of the blocks — *Cylinder-Printing.* This is the kind by which the great bulk of printed goods is produced. The pattern is engraved on a roller or cylinder, instead of on a flat block. The roller is of copper or brass; a coating of varnish is given to it; the pattern is etched on the varnish with a diamond point, and then eaten in or engraved by the action of dilute nitric acid. Sometimes the engraving is impressed by Perkins's rolling-machine; sometimes, again, the engraving is done by an engine like that employed in engine-turning; and occasionally the rollers are of wood, with a pattern made by inserted slips of copper. The rollers are from 30 to 40 inches long, by 4 to 12 in diameter. There are as many rollers as there are colors — one to each (Fig. 51); there are also as many distinct troughs or cells of dyestuff or pigment as there are colors; and the cylinder machine is a skilfully planed apparatus, by which all those rollers and troughs can be brought into action, each one just at its proper time and in its proper place. Some elaborate patterns have as many as 20 different colors and shades of color; and then the arrangements are very complicated; but from 1 to 4 is the most usual number. So perfect are the adjustments, that one mile of calico can be printed in one hour. — *Accessory Machines.* The machines and processes accessory to

the actual printing are numerous. The printed cloth is dried by a gas-heated *drying-machine;* and then transferred to the *airing-room*, where the action of the air, aided sometimes by a little steam, causes the colors to adhere more firmly to the fibres. The *clearing-beck* is a vessel in which the printed cloth (if some particular kinds of color are used) is scoured with soap and water; and there are *washing-machines* also, with clear water only. — The *Madder Style* is the name given to a particular series of processes when the printing is with a machine chiefly used when madder is the principal dye. The *Indigo Style* denotes another series of processes, when the printing is with a *resist paste*, which prevents the dye from attacking those particular spots. The *Padding Style* is a third series, mostly suited for mineral colors, and requiring some of the colors to be in a thickened state. The *Discharge Style* is a fourth (already noticed under BANDANA). The *Steam Color Style*, largely employed for furniture chintzes, requires the action of steam to fix the colors upon the cloth.

Calidad, a choice kind of Cuba tobacco.

California, a Western State of the U. States, bounded W. by the Pacific Ocean, along the coast of which it extends from 32° 45′ to 42° N lat., S. by the peninsula of Lower California and the Gila River, which divides it from Mexico, E. by Nevada and the Rio Colorado, and N. by the State of Oregon; average length, about 700 m., breadth, 200 m.; area, 156,687 sq. m., or more than 100,000,000 acres, of which 35,000,000 are arable, 23,000,000 pasture, and about 5,000,000 swampy and inundated lands, but possibly reclaimable. The surface and climate of *C.*, although extremely varied in character, bear everywhere a peculiar impress, very different from that of the Atlantic coast and Mississippi Valley States. *C.* may be divided into three great distinct portions, and these are very different from each other in importance, — the central being much the most densely populated, and in every respect the most valuable. This central portion is embraced between the parallels of 35° and 40°, and has on its eastern side the Sierra Nevada, and on its western the Coast Ranges, with the Pacific Ocean at its western base. Between these two mountain chains lies the Great Central Valley, which is drained by the Sacramento and the San Joaquin, the two uniting about midway between the N. and S. extremities of the Valley, and entering the Bay of San Francisco through Suisson and San Pablo bays, which latter is, in fact, but the N. expansion of San Francisco Bay itself. The entire length of the Great Valley is about 450 m., and its breadth averages about 40 m.; area, 57,200 sq. m. The drainage of this entire area reaches the sea through the Golden Gate. There are several large mountain lakes in *C.*, some of which are of pure and fresh water, while others are alkaline, being without an outlet. The finest of these is Tahoe, which lies on the very summit of the Sierra, and at an elevation of 6,200 feet. It has a length of about 20 m., and is 1,500 feet deep, its water being extremely pure. North of the parallel of 40°, where the Coast Ranges and the Sierra unite, and where the Great Valley disappears, the country is extremely rough and very thinly inhabited. The 7 counties which are included within the region N. from the head of the Sacramento Valley to the State line had in 1870 a pop. of only 19,269, and they had all lost in numbers during the previous decade. The N.W. corner of the State is also extremely rough and mountainous, and a large part of it is quite uninhabited. That portion of *C.* which lies to the S. and E. of the southern inosculation of the Coast Ranges and the Sierra, comprising an area of fully 50,000 sq. m., is also very thinly inhabited, with the exception of a narrow strip along the coast. Nearly all of San Diego and San Bernardino Counties belong to the Great Basin system, having no drainage to the sea. The Angeles County, however, has within its borders some of the most fertile lands in the State. These form a strip about 20 m. wide along the coast; the N.E. half of the county, on the other hand, is extremely barren. The region lying E. of the Sierra Nevada, and between the crest of that range and the boundary of the State, chiefly between the two counties of Mono and Inyo, is also a very mountainous tract of country. The *climate* of *C.* is very different in different parts of the State, according to distance from the ocean, situation with reference to the mountain ranges, and altitude above the sea level. But there are certain peculiar features which obtain all over the State. In the first place, the division of the year into two seasons — a dry and a rainy one — is the most marked characteristic of the *C.* climate. But as one goes north, the winter rain is found to begin earlier and last longer; while, on the other hand, the S.E. corner of the State is almost rainless. Again, the climate of the Pacific coast, along its whole length, is milder and more uniform than that of the States in a corresponding latitude E. of the mountains. We notice, in addition, that the means of summer and winter are much nearer the mean of the year in *C.* than in the East. This condition of things is not so marked as we advance into the interior of *C.*; but everywhere in the State the winters are comparatively mild, and the heat of summer is much less disagreeable in its effects, because the air is excessively dry and the evaporation proportionally rapid. The climate of San Francisco is indeed wonderfully uniform; and the bracing, cool air which sweeps in from the ocean during the afternoons of the summer, although not favorable to persons with weak lungs and sensitive throats, is the very breath of life for those who are in vigorous health. One great drawback to the enjoyment of the delightful climate of *C.*, however, is the dust of summer, which seems, until one becomes accustomed to it, quite unbearable. *C.* was for many years chiefly known to the world as the region where gold was obtained in extraordinary quantities. The existence of *gold* in *C.* had long been known, but no discovery had been made, which attracted much attention, previous to January, 1848, when a piece of native gold was picked up in an excavation made for a mill-race on the south fork of the American River, at a place now called Coloma. The excitement caused by that discovery, and the consequent emigration to the land of gold, continued till 1854, when there was a decided reaction throughout the U. States in regard to mining matters. The Californian discoveries had given rise to a general search for metalliferous deposits in the Atlantic States; and this had been followed by wild speculations, a great deal of money having been sunk in opening new mines, and in attempting to develop old ones which had never yielded anything of value. *Silver*-mining has been attempted in many localities of *C.*, and much money spent in trying to develop the argentiferous lodes which have from time to time been discovered; but the only paying silver mines in the State seem to be those of the Inyo Range, and Cerro Gerdo, where the ore is chiefly galena, rich

Fig. 52. — SEAL OF CALIFORNIA.

in silver, and also containing considerable gold. *Quicksilver* is largely produced at the New Almaden, Guadaloupe, Aurora, and other mines. *Iron*, in large quantities and various forms, is found in all the Coast Ranges. *Platinum* is almost as widely dispersed through the State as gold, though in smaller quantities. Tin, chromium, gypsum, nickel, antimony, bismuth, sulphur, lead, salt, saltpetre, borax, coal, marble of extraordinary beauty, alabaster, granite, buhr-stone, lime, etc., are the other principal mineral products of the State. — Owing to the peculiarities of the climate, and especially its mildness in winter and the dryness in summer, the whole system of cultivation is very different in *C.* from what it is in the Mississippi Valley. If the season is favorable, that is, if rain falls in abundance in November, so that the ground becomes soft enough to plough, then sowing is begun at once, and the best crops are raised when the "latter rains," which fall in March and April, are tolerably abundant, and yet not so much as to cause inundations. Almost everything, except ploughing, in connection with agricultural work is done on a large scale, with the help of machinery; and the profitable farms are usually of great size, comprising many thousand acres. In 1878, the amount of the principal productions of the soil were as follows: Wheat, 22,000,000 bu.; Indian corn, 1,550,000 bu.; oats, 1,750,000 bu.; barley, 7,800,000 bu.; potatoes, 3,200,000 bu.; hay, 560,000 tons. In the same year there were in *C.* 1,000,800 oxen and other cattle; 6,561,000 sheep; 438,500 hogs; 262,600 horses; 25,400 mules; and 389,500 milk cows. Fruit is an item of great importance in the agriculture of *C.*, the quantity raised being very large, and the quality excellent. The pear, plum, apricot, and grape are especially good. A large amount of capital has been invested in the manuf. of wine; and though the quality is not still all that could be desired, it is gradually improving, and the day may be foreseen when the Eastern market will be widely open to it. *C.* is a country particularly adapted to raising sheep, and the wool interest is a very important one. The winters are so mild, that shelter for the flocks is not required, and they have no other food than that which they pick up for themselves on the lower plains in winter, and in the higher mountain valleys in the summer. The *commerce* of *C.* being mainly carried on through San Francisco, which is the only port of entry in the State, we refer to the name of that city for an account of the commercial and manufacturing interests of the State. The principal towns are San Francisco, Sacramento City (the capital), San José, Marysville, Stockton, Nevada, Grass Valley, Petaluma, Yreka, Placerville, Oakland, etc. *Pop.* 560,285. See San Francisco.

California Pacific R.R., runs from South Vallejo to Sacramento, Cal., 60.17 m., with branches, 78.01 m.; total, 138.18 m. Offices in San Francisco. This Co., chartered in 1869, is a consolidation of the California Pacific and the California Pacific Extension R.R. Cos., and is leased to the Central Pacific R.R. at a rental of $550,000 per annum, in addition to three-quarters of the net earnings in excess of the amount. *Capital Stock*, $12,000,000. *Funded Debt:* first mortgage, issued 1867, $2,250,000, payable 1887, int. 7% (Jan. and July); second mortgage, issued 1871, $1,600,000, payable 1891, int. 6% (Jan. and July); third mortgage A, issued 1875, $2,000,000, payable 1905, int. 6% (Jan. and July); third mortgage B, issued 1875, $1,000,000, payable 1905, int. 6% (Jan. and July). The three last are indorsed by the Central Pacific R.R. Co.

Calin, an alloy of tin and lead, used by the Chinese for tea-canisters and other articles.

Calipers, or Caliper Compasses, are compasses with curved legs for measuring the diameter of cylinders, balls, or other round bodies.

Calisaya. See Cinchona Bark.

Calisthenic Instrument Maker, a manufacturer of chest expanders, etc.

Calk, a name for lime.

Calking, the process of tracing with a style or hard pencil through a print which has been rubbed with colored chalk at the back; or, copying a drawing by tracing with chalk.

Calkins, or Cawkins, the prominent or elevated extremities of the horse's shoe, forged thin, and turned downwards to prevent slipping.

Call, a visit. — The demand for payment of an instalment due on shares. — A speculation on the Stock Exchange, which consists in selling stocks to be delivered on call at any day within a fixed period. — *Call and Put*, is a stock-broker's term for a transaction such as the following: A., anticipating the rise of a given stock, puts up $100 with D. for the privilege of calling upon the latter for 100 shares of the stock at or within a given time, say 30 or 60 days. If the stock rises, he calls for his 100 shares, and takes the difference between the price agreed upon and the price on the day he calls. If the stock falls, the transaction is closed by the forfeiture of the $100. On the other hand, if A. believes a given stock will fall, he puts up say $100, and agrees to deliver to D. say 100 shares, at a given time at a given price. If the stock falls below the price agreed upon, he calls upon D. for the difference; if it rises, the transaction is closed by the forfeiture of the $100 (*Thomas McElrath*). — *Call in*, to collect as outstanding debts, money, etc.; or, to recall from circulation, as currency notes. — *Call on*, to solicit payment of a debt; also, to ask assistance, as, to call on a bank for a loan.

Callao. See Peru.

Callibogus, a drink made in Newfoundland by adding spirits to spruce beer.

Calligraphy, the art of fine penmanship.

Callipers. See Calipers.

Callipeva, an esteemed river mullet of the West Indian seas (*Mugil liza*), seldom extending further than the embouchures of streams, or into the ponds and marshes. Its scales are useful for making ornaments, and its roe forms an excellent caviare.

Callou, the Spanish wine or fermented liquor extracted from palms.

Calmucks, a sort of woollen hair-cloth.

Calmus, a German wine resembling the sweet wines of Hungary, made in the territory of Frankfort, at Aschaffenbourg.

Calomel, a mild preparation of mercury, the dichloride, used in medicine as an alterative or purgative. *Imp.* duty, 30 per cent.

Calorimeter, an instrument to indicate the heat given out by bodies in cooling, or passing from one temperature to another, which is ascertained by the quantity of ice it will melt.

Calotype Process. See Photography.

Calumba Root. The calumba plant (*Cocculus palmatus*) grows in Malabar, and in the thick forests of the E. coast of Africa, between Oibo and Mozambo, from which last place the roots form a staple export to Ceylon, and thence to Europe. The root is generally brought in transverse sections, from half an inch to 3 inches diameter, rarely divided across; and the bark is of a dark brown color outside, and bright yellow within. It is very subject to decay by worms. When good, it looks bright and solid, breaks with a starchy

fracture, and has a faint aromatic odor and bitter taste. It is a most valuable antiseptic and tonic. *Imp.* free. — The American *C.* of the Southeastern States (*Frasera walteri*) is not so valuable. It may be distinguished by its whiter color, lighter texture, the mixture of longitudinal pieces, and the taste being at first sweetish, and not nearly so bitter as the genuine root.

Calzado, the Spanish name for a shoe or sandal of any kind.

Cam, a contrivance for converting a uniform rotatory motion into a varied rectilinear motion. The end of a rod, which is free to move only in the direction of its length, is held in contact, by the action of a spring or weight, with the edge of an irregularly shaped mass, which revolves uniformly upon an axis. A varied motion is thus communicated to the rod, which carries with it the machinery by which the motion is to be applied. This contrivance is much used in the machinery for lace-making.

Camail [Fr.], a domino; a capuchin, or short cloak, sometimes made of fur. — A purple ornament worn by a bishop over his rochet.

Camara, a store-house for grain. — The hard, tough, and valuable timber of *Dipterya odorata*, a tree found in Essequibo.

Camata, the commercial name for half-grown acorns, dried, which are imported for tanning.

Cambay Stone, a kind of cornelian, obtained in the East Indies.

Camber, a repairing wet dock, or inlet from a harbor. — *Camber-beams*, are those used in the flats of truncated roofs, and raised in the middle with an obtuse angle, for discharging the rain-water towards the sides of the roof. — *Camber-slip*, an instrument for drawing arches.

Cambiale, the Italian name for a bill of exchange.

Cambio [Sp.], barter, the giving or taking bills of exchange; a rise or fall in the course of exchange.

Cambirt, a money-changer; one well versed in exchanges and foreign moneys; a trafficker in bills. Also applied to a book descriptive of moneys, weights, and measures of various countries.

Cambrel, an iron with hooks to hang meat on.

Cambric [Fr. *batiste;* Ger. *kammertuch;* It. *cambraja;* Port. *cambraia;* Sp. *cambrai*], a very fine linen fabric, so called from having been originally manuf. at Cambray, a city of France; also, a fine cotton fabric in imitation of linen. Its varieties are glazed, white, and colored for linings, twilled, figured, striped, and corded. Cotton *C.* are either white or printed for dresses, or used as French batiste. The former are made chiefly in Lancashire, England; the latter in Glasgow, Scotland. Scotch *C.* is an imitation *C.* made from fine hard-twisted cotton. *Imp.* duty (valued at not over 30 cts. per sq. yd.), 35 per cent; (valued at over 30 cts. per sq. yd.), 40 per cent.

Camel [Arab. *djemal*], a ruminating quadruped of a grotesque form, which has been used from a remote period in Eastern countries as the principal beast of burden. There are two species: the Bactrian *C.* (*Camelus bactrianus*), characterized by a couple of humps, — one on the rump and another above the shoulders, — is employed in Thibet, Turkestan, Tartary, and S. Russia; the dromedary (*Camelus dromedarius*), with one hump situated on the middle of the back, is indigenous in Arabia, from whence it has spread over the north of Africa, Syria, and Persia; and the intermixture of these two species has produced varieties which are more or less used in different localities. The *C.* is esteemed by Eastern nations one of the most precious gifts of Providence to man; and assuredly it seems formed by nature for a life of patient drudgery. Justly has the Arab named it the Living Ship of the Desert, as without it he could neither transport himself nor his merchandise across those oceans of sand with which his country is covered. Its spreading, cushioned feet, formed to tread lightly upon the dry and shifting

Fig. 53. — Loaded Camels.

soil; the nostrils, so formed that it can close them at will, to exclude the drift-sand of the parching simoom; the powerful upper teeth, for assisting in the division of the tough prickly shrubs, and dry, stunted herbage of the desert; and, above all, the cellular structure of the stomach, which is capable of being converted into an assemblage of water-tanks, — bear ample testimony to the care manifested in the structure of this extraordinary quadruped. The *C.* is weaned at the commencement of the second year, and begins to propagate when four years old, though it does not complete its full growth until the age of twelve. It will live as long as 40 years; but after 25 or 30 its activity begins to fail. *C.* are content with the coarsest food, — a bunch of dry grass, or the stunted shrubs of the wilderness. Their ordinary food is a ball of paste (*maabouk*), weighing about a pound, made of barley-meal and water, which each receives in the evening; and this is all the daily expense of these useful creatures. The value of the *C.* depends, of course, on its kind and quality. In Hejaz, the price of a good one is said to be $75, but they sometimes cost $200. *C.* are

used both for riding and carriage, for which purposes they are employed in large numbers in the Eastern caravans. The first thing that an Arab examines about his *C.*, when preparing for a long journey, is the hump, which is an infallible criterion as to the ability for exertion; for whenever it subsides, the beast gradually yields to fatigue. A long journey will cause the hump almost entirely to disappear. It is easily restored, however, by a few weeks of good nourishment and repose. The favorite pace of the riding *C.* is a kind of amble, at the rate of 5 or 5½ miles an hour. Many fabulous stories are related of the swiftness of this animal; but it never approaches, even for short distances, to that of a common horse, though it is perhaps unrivalled for the ease with which it will despatch an uninterrupted journey of several days and nights, if allowed its own natural pace, and not employed on hilly, woody, or slippery ground. The load of the carriage *C.*, in common cases, is from 400 to 500 lbs. for a short journey, and from 300 to 400 lbs. for one of any considerable distance. The capability of bearing thirst varies among the different races. In the caravans from Darfûr they travel nine or ten days without water; but the Anatolian *C.* requires drink every second day. — *Camel* is also the name of a contrivance for lifting ships over a bar or shoal that obstructs the navigation of a river.

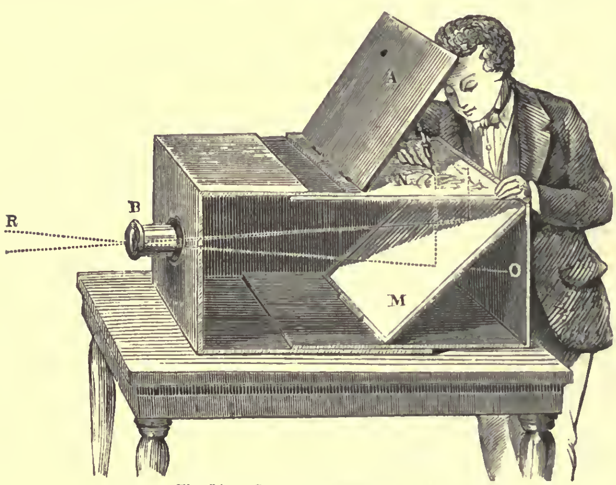


Fig. 54. — Sliding Camera Obscura.

Camels'-Hair [Fr. *poil de chameau;* Ger. *kameelhaar;* It. *pelo di camello*], is much longer than sheep's wool, and often as fine as silk. It is imported from the Levant, principally for the manuf. of pencils for the painter. That produced in Persia is held in the highest estimation. The black hair is most valued, next the red, and the gray brings only half the price of the red. In the East, *C.-H.* is woven into clothing, and even tents, purposes to which it has been applied from a remote period. *Imp.* duty (cleaned or uncleaned, but not manuf.), 10 per cent; (pencils), 35 per cent.

Camels'-hair Shawls. See Cashmere Shawls.

Camellia, a genus of beautiful evergreen shrubs. The seeds of *Camellia oleifera,* a native of China, yield an excellent table oil. The large, splendid, rose-like flowers of several species of *C.* are much prized, being cultivated in private hot-houses, and sold by florists.

Camelot. See Camlet.

Cameo [Fr. *camée*], a gem worked in relievo; a small bas-relief cut on various substances, as stone, shell, lava, ivory, etc. They are frequently cut on certain conch shells, or strombs, the substance of which consists of two distinct layers of different colors, textures, and hardness. The black conch offers the most decided contrast of color in the layers. Shell cameos are now very common, and some display a great deal of taste in the design, cutting, and adaptation of the various layers of the helmet and other shells to the required tints. Imitation *C.* are made by pressing or moulding porcelain or other plastic material. *Imp.* duty (not set), 10 per cent; (in frames), 20 per cent; (imitations, set), 25 per cent; (imitations, not set), 40 per cent.

Camera Lucida, invented by Dr. Wollaston, is an apparatus containing a glass prism with angles of definite measurement. When the light from any object falls on one side of the prism, it is reflected down upon a piece of paper, and an eye, placed near an angle, sees the image and the paper at the same instant. The instrument assists in drawing or delineating, but is now nearly superseded by photography.

Camera Obscura, an optical instrument in the shape of a box with an opening at the end to receive a lens; and there is a kind of telescopic action which allows this lens to be brought into various positions for adjustment of focus. At the other end of the box is a screen of ground glass, so placed as to receive the image of any object focalized by the lens. For a common camera, there is an intermediate reflector at an angle of 45°, which throws the image on a horizontal ground glass, when it appears as a small picture. For a magic lantern, painted slides are used. See Photography.

The *sliding camera obscura,* represented in Fig. 54, enables any one, without a knowledge of the rules of drawing or perspective, to delineate distant objects, trace the outlines of landscapes, etc., with perfect accuracy. It consists of a rectangular box, in which the luminous rays R penetrate through a lens B, and are directed to the opposite side O, there to form an image. But the rays, intercepted by a glass mirror M at an angle of 45°, change their direction, and come to form the image on a screen of ground glass N. If a sheet of tracing-paper is placed on that screen, the image can be accurately delineated with a pencil. A little board A intercepts the light, which, if falling on the image, would not permit it to be seen. The box consists of two separate parts, sliding the one in the other, so that, by drawing more or less the anterior part, according to the distance of the object, the reflected image comes exactly on the screen N.

Cames, rods of cast-lead used by glaziers in framing church windows and other quarrels of glass.

Camfering, taking off an angle or edge of timber.

Camion, a term now used for a dray, formerly applied to a hand-truck.

Camionage, the French word for cartage or dray-hire.

Camlet [Fr. *camelot;* Ger. *kamelot;* It. *ciambello*], was originally a rough fabric made of the hair of the camel and the goat interwoven, which was used by ascetics. That of the East is made of the hair of the Angora goat. English *C.*, however, is a light stuff, made of long wool hard spun, some-

times mixed in the loom with cotton or linen yarn.

Camomile, or CHAMOMILE, the flowers of *Anthemis nobilis*, employed medicinally in Europe as a cheap, tonic, carminative anodyne; when taken in large doses, however, they prove powerfully emetic. *Imp.* free.

Campeachy Wood. See LOGWOOD.

Camp-Bed, a folding iron bedstead, with tester laths, for field use.

Camp Furniture, articles of cabinet-work, made compact, light, and portable, so as to be easily folded and transported.

Camphine, or BURNING FLUID, a trade-name for essential resinous oils, such as the purified oil or distilled spirits of turpentine. When intended for a burning fluid, it is mixed with alcohol in various proportions.

Camphor [Ar. *kafoor;* Fr. *camphre;* Ger. *kampfer;* It. and Port. *canfora;* Sp. *canfor*], a peculiar vegetable principle arising from the separation of the volatile oil of different trees, which is used in medicine and the arts. Two kinds are distin-

Fig. 55. — CAMPHOR TREE.

guished in commerce: *China* or *Java C.*, the only kind met with in Europe, is the product of the *Laurus camphora* (Fig. 55), found in Quangtung and Fokien in China, in Cochin China, and in Japan. It is extracted from all parts of the tree, but chiefly from the roots, and is obtained in the state called *crude C.*, merely by sublimation. In this state it is generally imported, and is afterwards refined by mixture with lime and a second sublimation. Crude *C.* occurs in small brownish or gray grains mixed with impurities. Refined *C.* is a very white, soft, semi-transparent substance, having a crystalline appearance, a strong and fragrant odor, and a hot, pungent taste; very inflammable, and so volatile as totally to exhale when left exposed in a warm air. Sp. gr. 0.985. It occurs in round cakes, each weighing about 2 lbs., and is commonly packed in vessels containing nearly 250 cakes. The quantity of *C.* exported from Canton varies much from year to year. In the U. States, 1,117,290 lbs. of crude *C.*, valued $166,695, were imported in 1878. — *Malay* or *Barus C.* is found in great purity concreted among the woody fibres of the *Dryobalanops camphora*, growing in Borneo, Sumatra, and the Malayan Archipelago. As an article of commerce, it is found exclusively in the East, and particularly at Canton, where it fetches a price equal to about 100 times that of the article made from their own *L. camphora.* The former is far more fragrant than the latter, but whether it possesses any superior virtues is exceedingly doubtful. *Imp.* duty (crude), free; (refined), 5 cts. per lb.

Camphor Julep or **Water**, a solution of camphor, used as a vehicle for the administration of fever medicines.

Camphor-Oil, or LIQUID CAMPHOR, is a pale yellowish, limpid, and fragrant liquid, obtained from the Borneo camphor-tree (*Dryobalanops camphora*). It is largely used at Singapore instead of turpentine.

Camphor-Wood, the timber of the camphor-tree (*Laurus camphora*), is used for trunks and articles of furniture, its strong and aromatic odor having the property of keeping off moths and other noxious insects.

Campione, the Italian name for a journal or ledger.

Camwood, a red dyeing wood, the produce of *Baphia nitida*, imported from the west coast of Africa. *Imp.* duty (in sticks), free.

Can, a tin vessel for milk, and for other purposes. — A liquid measure of Siam, equal to 4 10 pints; also, an abbreviated name for the candareen, a Chinese weight and measure.

Canada (Dominion of), the comprehensive name given to all of the British colonial provinces in N. America (Newfoundland excepted), divided as follows: —

Provinces.	Square Miles.	Population.
Ontario	121,260	1,620,851
Quebec	210,020	1,191,516
Nova Scotia	18,660	387,800
New Brunswick	27,105	285,594
Manitoba	2,891,734	11,953
British Columbia	213,000	10,586
Prince Edward Island	2,173	94,021
Total	3,483,952	3,602,321

The above provinces are united under the provisions of an act of the British Parliament passed in March, 1867, known as "The British North America Act, 1867," which came into operation on the 1st July, 1867, by royal proclamation. The act orders that the constitution of the Dominion shall be "similar in principle to that of the United Kingdom;" that the executive authority shall be vested in the Sovereign of Great Britain and Ireland, and carried on in her name by a Governor-General and Privy Council; and that the legislative power shall be exercised by a Parliament of two Houses, called the "Senate" and the "House of Commons." The members of the Senate of the Parliament of the Dominion are nominated for life, by summons of the Governor-General under the Great Seal of Canada. By the terms of the constitution, there are 78 senators; namely, 24 from the Province of Ontario, 22 from Quebec, 12 from Nova Scotia, 12 from New Brunswick, 2 from Manitoba, 3 from British Columbia, and 3 from Prince Edward Island. Each senator must be 30 years of age, a born or naturalized subject, and possessed of property, real or personal, of the value of $4,000 in the province for which he is appointed. The House of Commons of the Do-

minion is elected by the people, for five years, at the rate of one representative for every 17,000 souls. At present, on the basis of the census returns of 1871, the House of Commons consists of 206 members; namely, 92 for Ontario, 65 for Quebec, 18 for Nova Scotia, 4 for New Brunswick, 5 for Manitoba, 6 for British Columbia, and 6 for Prince Edward Island. The 7 prov. forming the Dominion have each a separate parliament and administration, with a Lieutenant-Governor at the head of the executive. They have full powers to regulate their own local affairs, dispose of their revenues, and enact such laws as they may deem best for their own internal welfare, provided only they do not interfere with, or are adverse to, the action and policy of the central administration under the Governor-General.

The political capital of the Dominion is Ottawa, in the Prov. of Ontario; *pop.* 21,545. The *pop.* of the other principal cities is as follows: Montreal, 107,225; Quebec, 59,695; Toronto, 46,092; Halifax, 29,582; St. John, 28,988; Hamilton, 26,716; and London, 15,826.

The Dominion of *C.* is bounded N. by Baffin's Bay, the Arctic Ocean, and Alaska, W. by Alaska and the Pacific Ocean, S by the United States, and E by the Atlantic Ocean Though it includes the Rocky Mountains, with the picturesque and diversified region lying between them and the Pacific, and the Laurentian range, continued northward to the Arctic Ocean, *C.* is, upon the whole, a level and well-watered country. The climate is salubrious, and heat and cold, though felt in their extremes, are not oppressive, owing to the purity of the atmosphere. The thermometer ranges between 102° above and 36° below zero, Fahr. Throughout nearly its whole area, *C.* is characterized by greater heat in summer, and much lower temperature in winter, than in corresponding European latitudes; the variations, however, being less than in many countries of much smaller extent. The severity of the Canadian winter is much less unfavorable to the operations of agriculture than might at first appear. The snow effectually prevents the frost from penetrating deeply into the earth, and the rapid progress of the spring thaws, followed by frosty nights, pulverizes the soil, and helps to prepare it for seed. Against the severity of the winter must also be set down the steady weather which prevails during summer, and which renders the progress of vegetation so rapid, that the Canadian harvest is early, and almost always secured before bad weather commences. Hence the climate of *C.*, severe though it is, presents no obstacle to the unlimited extension of almost every description of produce, except such as is peculiar to a tropical climate. The Canadians are scattered over a vast extent of country, but owing to the facility of communication by means of lakes, rivers, canals, and railroads, the expense of transport is relatively small. The St. Lawrence is navigable for large ships to Montreal, about 600 m., and to Quebec, 420 m., for ships of the line; above Montreal, its current is broken by rapids. The Ottawa and Saguenay, the principal tributaries of the St. Lawrence, are only partially navigable, having their course likewise interrupted by falls and rapids. Besides the Great Lakes, which find their outlet through the St. Lawrence to the sea, there are thousands of lakes throughout *C.*, many of them of large dimensions, foremost among which is Lake Winnipeg. In 1878, *C.* had a network of railroads of a total length of 6,412 m. There were at the same period lines of a total length of 1,027 m in course of construction, and 3,000 m. more had been surveyed, and concessions granted by the government. Partly included in the latter class is the railroad crossing the whole of the Dominion, from the Atlantic to the Pacific, to the construction of which the British government contributes a grant, in the form of a guaranteed loan of $12,500,000.

In superficial extent the Dominion is nearly equal to the whole of Europe. About 120,000 sq. m. consist of prairie lands, with occasionally scattered groves and belts of trees along the rivers, admirably adapted for agriculture. A larger tract, consisting chiefly of timber land, but interspersed with prairies, and well fitted for settlement and farming operations, cover about 500,000 sq. m. Beyond these two available regions of land, adapted by soil and climate for the growth of wheat and other grains, and the raising of stock, there is a further belt of land, which, though lying in a colder zone, is timbered, clothed with good natural grasses, and fit for the growth of barley and oats. Its area is estimated at little less than 930,000 sq. m. All this, as well as much more still uncleared within the various provinces, has to be settled and brought under cultivation; and out of the great prairie and forest lands of the N W. have yet to be furnished the future provinces of the Dominion.

Extending from the Atlantic to the Pacific Ocean, *C.* has an extensive line of sea-coast, indented with bays and harbors, offering the most admirable facilities for every branch of maritime enterprise; and to this will, no doubt, be added ere long the island of Newfoundland, with the command of fisheries unequalled in value either in the Old World or the New. The peninsula of Nova Scotia and the island of Newfoundland form the eastern barriers of British North America, closing the Gulf of St. Lawrence, and commanding the Atlantic coast, with its ocean trade and its inexhaustible fisheries; while Vancouver Island and the shores of the neighboring mainland stretch along the Pacific coast, with estuaries, inlets, and well-sheltered harbors, awaiting the development of the growing trade of the Pacific. There the rivers abound with salmon; the whale fisheries of the neighboring ocean already yield valuable returns; and the cod, haddock, and other deep-sea fish invite enterprise, and guarantee an inexhaustible source of future wealth.

Shipbuilding is an important employment in all the ports of *C.*, and the ships built at Quebec are renowned for their beauty, solidity, and sailing qualities. The tonnage of shipping registered in each of the provinces in 1878 was as follows: —

Provinces.	Vessels.	Tons.
Nova Scotia	2,786	505,144
New Brunswick	1,133	307,926
Quebec	1,831	222,935
Ontario	825	114,990
Prince Edward Island	335	50,677
British Columbia and Manitoba	42	3,863
Total	6,952	1,205,565

C. stands third in the list of maritime powers, only England and the U. States possessing a larger commercial marine. The development of this marine is due largely to the extensive fisheries of the Gulf of St. Lawrence.

The manufacturing interests are rapidly increasing in importance in the Provinces of Quebec and Ontario. The culture of the soil, however, is the principal occupation of the Canadian people, and the staple articles of export are wheat, wood, and wool. The trade of the Dominion is chiefly with the U. States and Great Britain. In 1878, the total value of imports was $91,199,577, while the value of exports footed up to $79,323,667, leaving a balance of trade against *C.* of $11,775,910 For the same year, the commerce of the Dominion with the U. States was as follows: —

Imports from the U. States, $34,613,890, principally composed of the following articles: Cattle, $452,547; books, $130,098: bread and biscuit, $186,041; Indian corn, $4,433,621; Indian corn meal, $665,575; oats, $692,691; wheat, $6,945,515; wheat flour, $2,002,141; bricks, $234,203; carriages, $71,236; bituminous coal, $672,274; cordage, rope, etc., $36,747; cotton, $798,951; manufactured cotton, $1,201,371; drugs and medicines, $164,141; fancy articles, $211,853; fruits (green and dried), $425,718; furs, $75,982; glass and glass ware, $332,535; gold coin, $802,748; jewelry, $33,916; hats and caps, $238,545; hides and skins, $390,347; india-rubber manuf, $95,675; iron (pig and bar), $236,521; castings, $193,013; machinery, $299,203; nails and spikes, $122,692; other manuf. of iron, $1,086,756; steel (manuf.), $105,356; boots and shoes, $129,959; leather, $93,225; lime and cement, $55,990; marble (rough and manuf.), $133,320; organs and pianos, $149,695; mineral and lubricating oil, $203,455; lard oil, $34,909; paper and stationery, $270,439; bacon and hams, $568,732; salted beef, $76,368; butter, $173,971; cheese, $179,433; fish (dried, pickled, and cured), $158,360; lard, $259,485; pork, $878,641; seeds, $297,297; sugar (refined), $1,036,623; tobacco (leaf, cigars, etc.), $982,616; wearing apparel, $173,187; wood (boards, deals, shooks, staves, etc.), $528,649; wood (sawed and hewn timber), $676,210; wood (household furniture), $563,645; wood (all other manuf. of), $257,755; wool (manuf.), $327,585.

Exports to the U. States, $27,656,865, the chief articles of which were: Eggs, $719,871; fish (fresh and pickled), $1,920,396; fur-skins (undressed), $849,192; gold bullion, $880,936; gold coin, $1,718,874; plaster of Paris, $103,253; hides and skins (not furs), $440,426; personal effects of travellers or immigrants, $878,008; fish oil (foreign), $107,116; barley, $4,104,780; barley-malt, $398,763; rye, $277,467; wheat, $1,534,283; pease, beans, etc., $601,744; chemicals, drugs, etc, $86,351; bituminous coal, $924,899; copper (ore and manuf.), $113,528; fruit, $89,594; furs (dressed), $103,827; iron (and manuf of), $463,308; marble, $102,066; potatoes, $143,321; provisions (meat, poultry, etc.), $328,072; salt, $109,925; seeds, $89,371; sugar (brown), $69,291; molasses, $47,268; tin (in plates), $367,413; spirits, $131,317; wood (cabinet ware), $155,862; wood (boards, planks, etc.), $3,468,807; wool (unmanuf.), $750,286.

In 1878, 11,007 Canadian vessels, of 2,599,365 tons, and 144 steamers, of 72,735 tons, entered the ports of the U. States; and 11,197 vessels of 2,608,696 tons, and 141 steamers of

71,211 tons, cleared. 5,701 American vessels of an aggregate tonnage of 1,318,058, and 445 steamers of 430,973 tons, entered the Canadian ports; and 5,805 vessels of 1,269,017 tons, and 437 steamers of 434 577 tons, cleared

Finances. The financial accounts of the Dominion are made up under three different headings; namely, first, "Consolidated Fund," comprising the general sources of revenue and branches of expenditures; secondly, "Loans" in revenue, and "Redemption" with "Premiums and Discounts," in expenditures; and, thirdly, "Open Accounts." The total revenue, under these divisions, for the financial year 1877-78, was $43,922,068 14; and the expenditure, $43,075,840.96. The public debt, incurred chiefly on account of public works, and the interest of which forms the largest branch of the expenditure (interest and sinking fund, $7,413,452), was as follows: —

Funded Debt.

Payable in London.

Imperial Guarantee, 4 per cent	$23,360,000 00
Intercolonial Loan, 5 per cent	2,433,333.34
Consolidated Canadian Loan Bonds, 5 per cent	22,353,481.88
" " " Stock, 5 per cent	9,021,607.29
Canadian Bonds (old), 5 per cent	20,926.72
" " 6 per cent	23,020,793 39
Nova Scotia Bonds, 6 per cent	1,082,833.35
New Brunswick Bonds, 6 per cent	4,491,446.67
British Columbia Bonds, 6 per cent	924,666.67
Prince Edward Island Bonds, 6 per cent	1,091,106 54
Dominion Loan of 1874, 4 per cent	19,466,666.67
" " 1875, 4 per cent	4,866,666.66

Payable in Canada.

Canada Bonds (old), 5 per cent	127,016 67
Canadian Bonds (old), 6 per cent	17,500 00
Nova Scotia, 6 per cent	954,353.34
New Brunswick, 6 per cent	130,100 00
Prince Edward Island, 6 per cent	308,004 46
Bonds convertible into Stock, 6 per cent	538,000.00
Dominion Stock, 6 per cent	4,124,643.83
" " 5 per cent	1,923,433 15
Savings Banks, Post Office, 4 per cent	2,416,363.49
" " " " 5 per cent	324,589.10
" " Toronto, 4 per cent	167,789 30
" " Winnipeg, 4 per cent	40,685.75
" " Nova Scotia, 4 per cent	1,666 334 75
" " " " 4 per cent	1,187,068 26
" " British Columbia, 5 per cent	927,954 97
" " Nova Scotia Suspense Account	4,021 53
" " " " Interest "	1,682 23
" " New Brunswick Suspense "	1,578 84
" " " " Interest "	780.20
" " Prince Edward Island, 4 per c	305,269 67
Indemnity to Seigneurs and Townships, 6 per c.	466,387.88
Notes, Canada	11,533,891 48
" Nova Scotia	43,228.79
Unpaid Warrants, Prince Edward Island	857 81
Overdue Debentures, Province of Canada	9,614 39
Total Funded Debt	$139,354,679 07

Money. The unit of account is the gold *dollar* of 100 cents = $1 of the U. States.

Weights and Measures. A new and uniform system was introduced by Act 36 Vict. cap. 48, assented to May 23, 1873. The act orders that "the *imperial yard* shall be the standard measure of length, the *imperial pound avoirdupois* the standard measure of weight, the *imperial gallon* the standard measure of capacity for liquids, and the *imperial bushel* the standard measure of capacity for commodities sold by dry measure" (see GREAT BRITAIN). Of old weights and measures usually employed, the chief are —

Wine gallon	0.83333 gallon.
Ale gallon	= 1 01695 "
Bushel	= 0 9692 imperial bushel.

By Act of 22 Vict. cap. 21, the weights of many articles held equal to the Winchester bushel were prescribed, as follows: —

Potatoes, turnips, carrots, parsnips, beets, and onions	60 lbs.
Flaxseed	60 "
Hemp seed	44 "
Blue-grass seed	14 "
Castor beans	40 "
Salt	56 "
Dried apples	22 "
Malt	36 "

By the same act the British hundred-weight of 112 lbs., and the ton of 2,240 lbs., were abolished, and the hundred-weight was declared to be 100 lbs., and the ton 2,000 lbs. avoirdupois, thus assimilating the weights of C. and the U. States.

Tariff. A new and very protective tariff of customs dues went into force on March 15, 1879. Since then, however, duties have been further advanced on several articles, and other changes are in contemplation, with the declared intention to force reciprocal duties with the U. States. The definitif tariff will be given in the APPENDIX to this work. See also RECIPROCITY TREATY.

For particulars on the ports and principal commercial places of the Dominion, see, COLUMBIA (BRITISH), HALIFAX, MONTREAL, QUEBEC, PRINCE EDWARD ISLAND, ST. JOHN, and TORONTO.

Canada, or CANADO, an old liquid measure of Spain and Portugal, still occasionally used. In Lisbon, the C. is equal to nearly 2½ pints; in Brazil, a weight of 32 lbs., and .703 of a wine gallon, or about 4 bottles; in Ceylon, the C. passes for 2.66 pints. The Spanish C. is much larger, being equal to 8.68 gallons.

Canada Balsam (*Balsamum Canadense*), a thick, viscid oleo-resin, obtained from the *Abies balsamea*, a tree of common growth in Canada and the State of Maine. It is much employed as a medium for mounting microscopic objects. When pure it is perfectly transparent, has an agreeable odor (not terebinthinate), and is wholly soluble in rectified oil of turpentine, with which it forms a beautiful glassy and colorless varnish, much used for preparing a semi-transparent copying paper.

Canada Rice, a wild species of rice, the *Zizania aquatica*, growing in all the shallow streams and swamps of N. W. parts of the U. States, and in Canada. It is exceeding prolific of farinaceous seeds, which afford a very good food.

Canada Snake-Root. See SENEKA-ROOT.

Canada Sugar. See MAPLE SUGAR.

Canada Wool, the short staple or carding wool of the Canada sheep, readily sold in Boston and New York.

Canadian Yellow-Root, the root of *Hydrastis Canadensis*, which furnishes a valuable bitter and a useful yellow dye.

Canaille, a common name in Canada for shorts, or inferior flour.

Canal, an artificial navigable water-channel, formed for the passage of boats or vessels with cargo; also, sometimes for the purposes of irrigation, and the supplying of towns with water. Navigable C. have existed since a very remote period, but were principally confined to the low countries adjacent to the alluvial deltas of large rivers, such as the Nile, the Euphrates, and the great Chinese rivers; and in Europe the Po and the Rhine. In such countries, indeed, nature may be said to have pointed out this method of communication, as in every way the most convenient and simple. In Holland, the C. answer all the purposes of highways; they are mostly formed in straight lines, and the country being quite flat, they are constructed very simply, and without any of the costly expedients of deep cutting, embanking, or tunnelling. The lock, which is an indispensable appendage to C. in this and other countries, is comparatively a modern contrivance, having been first applied in Italy towards the end of the 15th century. The vast extent of water communicating in China has no locks even to this day. As a substitute, they have inclined planes of stone, over which they haul the vessels and launch them again in the upper level, thus applying main force to accomplish what is effected in the lock, by simply letting in the water from the upper level into the trough, and thereby raising the enclosed barge. In the planning of C., the first object is to select a line that conforms best with the levels and natural drainage of the country, so as to have as few locks as possible, and a plentiful supply of water to them at all seasons. The latter has to be regulated in a great measure by the amount of trade, or number of barges that

pass the locks, and the water must be supplied at the highest part of the *C.*; but the greater part of the waste is generally owing to loss by leakage through the gates, absorption through the ground, and evaporation. It sometimes happens that the adjacent streams are insufficient in dry seasons, or their water is taken off for mills; in such cases, reservoirs must be constructed, with weirs and sluices, at a great expense. To prevent loss by absorption, the whole extent of the *C.* is lined with a clay puddle, impervious to water; and in embankments, vertical layers, or sunk walls of the same material, are generally placed at each side, as further security. The U. States are pre-eminently distinguished by the spirit with which they have undertaken, and the perseverance they have displayed in executing, the most magnificent plans for improving and extending internal navigation. Besides many others of great though inferior magnitude, the Erie *C.*, which connects the Hudson with Lake Erie, is cited as one of the greatest and most important works of its kind in the world. This immense work, which is the property of the State of New York, has completely verified the predictions of its projector, De Witt Clinton, having been at once extremely profitable as a mercantile speculation, and of singular advantage, in a public point of view, to the State of New York and the Union generally. The foregoing table of the *C.* now in use in the U. States may give a general idea of the expense attending the constructing of *C.* In it are not included two *C.* which are now in course of enlargement,—the Illinois and Michigan C., connecting Chicago on Lake Michigan with La Salle on the Illinois River, a distance of about 100 m., and the ship *C.*, 1 m. long, at the Sault Ste. Marie, which conveys the waters of Lake Superior into Lake Huron.—*Barge* and *boat C.*, for the purposes of commerce, are now to a certain extent superseded by railroads; but *ship C.*, judging from the stupendous works of this class recently executed and now in contem-

TABLE OF THE UNITED STATES CANALS.

NAME AND LOCATION.	Length in Miles.	Width in Feet at Surface.	Width in Feet at Bottom.	Depth in Feet.	Number of Locks.	Date of Completion.	Cost of Construction.
DELAWARE.							
Chesapeake and Delaware, Ches. City to Delaware City	126	66	....	10	3	....	$3,547,561
INDIANA.							
Wabash and Erie, Evansville to Ohio State line........	374	40	26	4	64	1853	6,000,000
MARYLAND.							
Chesapeake and Ohio, Georgetown to Cumberland	184.5	52-60	31-42	6	74	1850	11,375,000
NEW JERSEY.							
Delaware and Raritan, New Brunswick to B'dentown..	43	75	....	8	14	....	3.935,287
Morris and Essex, Jersey City to Phillipsburg.........	101	40	....	5	29	....	2,825,997
NEW YORK.							
Erie..	363	70	56	7	72	1862	} 46,018,234
Champlain...	81	50	35	5	33	1837	
Oswego...	38	70	56	7	18	1862	3.490,949
Cayuga and Seneca..................................	23	70	56	7	11	1862	1,520,542
Black River Canal, and feeder.......................	50	42	26	4	110	1861	3,224,779
Genesee Valley	124¾	42	26	4	112	1861	5,827,813
Chenango..	97	40	24	4	116	1836	2,782,124
Chemung and feeder.................................	39	42	26	4½	53	1831	1,273,261
Oneida River Improvement.........................	20	80	60	4½	2	1850	146,944
Oneida Lake...	7	40	24	4	7	1836	64,837
Baldwinsville..	5¾	40	24	4	1	1839	23,556
Crooked Lake..	8	42	26	4	27	1843	333,287
OHIO.							
Ohio, Cleveland to Portsmouth......................	332	40	26	4	152	....	4,695,204
Miami and Erie, Cincinnati to Toledo...............	291	50-60	....	5.6	105	....	7,454,727
Hocking, Carroll to Athens..........................	56	....	....	....	26	....	975.481
Walhonding (branch of Ohio)........................	25	....	....	....	11	....	607.269
Muskingum Improvement, Dresden to Marietta.......	91	Variable.	....	....	12	....	1,627,318
PENNSYLVANIA.							
E. Div., Duncan's Island to Columbia................	46	50-60	34	6	11		Paid capital
Juniata Div., Duncan's Island to Hollidaysburg.......	127	40-60	24-30	4	66		stock.
Susqueh. Div., Duncan's Island to Northumberland...	41	40-60	24-30	4	44	1830	$4,457,150
W. Branch Div., Northumberland to Farrandsville....	80.5	40 60	24-30	4	43		Debt
N. Branch Div., Northumberland to Wilkesbarre......	64	40-60	24-30	4			3,274.600
Union, Middletown to Reading........................	77.6	43	28	4.5	132	1827	5,907,000
Junction, State line to Elmira, N. Y.	18	42	26	4	11	....	....
Delaware and Hudson, Honesdale to Rondout, N. Y...	108	48	30	6	106	1829	6,317,653
Delaware Div , Easton to Bristol.....................	60	44	26	6	32	1830	....
Lehigh Coal and Nav., Easton to Coalport............	48	60-100	45	6	53	1829	4,455,000
Schuylkill Coal and Nav., Mill Cr. to Philadelphia....	108	60-300	40-45	6	71	1825	13,207,752
Susquehanna, Columbia to Havre de Grace...........	45	50	30	5	30	1830	4,857,105
Wiconisco, Millersburg to Clark's Ferry..............	12	45	28	4	7	1836	512,000
Monongahela Nav., Pittsburg to N. Geneva...........	85	Slack	water.	Variable	8	1844	1,132,452
VIRGINIA							
James River and K'awha, Richmond to Buchanan....	196.5	40	....	4	90	....	6,139,280
Alexandria and Georgetown.........................	7	60	42	6	..	....	1,068,762
Dismal Swamp, Eliz. R. to D'mmond Lake............	33	....	....	....	..	....	1,151,000
Albemarle and Chesapeake..........................	8.5	....	....	....	..	....	170,000

plation, are as yet far from having exhausted the important aids they are destined to afford to navigation. See SUEZ CANAL, etc.

Statement showing the Receipts and Expenditures of each Canal of the State of New York during the fiscal year ending Sept. 30, 1878. Prepared by the Auditor of the Canal Department.

CANALS.	Income from Tolls and other Sources.	Cost of Collection, Ordinary Repairs, etc.	Surplus of Revenue.	Deficiency of Revenue.
Erie.........	$900,446.96	$512 692.38	$387,754.58	....
Champlain...	45,084.05	96,566 99	....	$51,482.94
Oswego......	12,731.89	33,489.38	....	20,757.49
Cayuga and Seneca	3,354.77	14,730 38	....	11,375.61
Chemung....	2,678.55	9,110 16	....	6,431.61
Chenango....	221 51	2,981.24	....	2,759.73
Black River..	12,906.52	36,727.41	....	23,820.89
Genesee Valley	9,954.24	31,099.03	....	21,144.79
Oneida Lake..	711.29	1,583.60	....	872.31
Baldwinsville.	....	....	....	....
Oneida River Improvement	300.08	....	300.08	....
Seneca River Towing Path	57.41	....	57 41	....
Cayuga Inlet.	104.08	52.04	52.04	....
Crooked Lake	100.00	716.36	....	615.36
Total.......	$988,651.35	$739,748.97	$388,164.11	$139,261.73

Canal-Boat, a flat-bottomed barge or boat of light draught, adapted for navigating canals.

Canal-Lift, a hydro-pneumatic elevator, for raising boats from one level to another.

Canal-Lock, a stop-gate, or sluice, to the chamber of a canal, for passing boats through from a higher to a lower level of the channel, or *vice versa*.

Canamo, the Spanish name for hemp.

Canary-Bird, a well-known song-bird, the *Carduelis Canaria*, is a native of the Canary Islands, but naturalized in Europe. About 150,000 are annually imported to New York from Bremen.

Canary Islands, or CANARIES, a group belonging to Spain, situated in the Atlantic, off the coast of Morocco, between 27° 40′ and 29° 30′ N. lat., and 13° 30′ and 18° 20′ W. lon.; total area, 3,220 sq. m. The inhabited islands are Teneriffe, Canary, Palma, Lanzarote, Fuerteventura, Gomera, and Hierro, or Ferro; total pop., 227,145. The seat of the governor-general is at Santa Cruz, the port of Teneriffe, in 28° 29′ N., and 16° 15′ W.; pop., 10,000. The other chief towns are Laguna and Orotava, in the same island, and Las Palmas in Canary.

The aspect of the *C.* is, throughout, elevated, and some of the mountains, particularly the Peak of Teneriffe, rank among the loftiest in the globe. The sides of the mountains inclining towards the W. and N. exhibit, rising above each other, the plants of the torrid, the temperate, and even the frigid zone. The islands are within the limits of the trade-wind, and the climate eminently salubrious. The most fertile are Canary and Teneriffe. Lanzarote and Fuerteventura are dry and sandy. An active commercial intercourse exists among the different islands, and upwards of 30 vessels are employed in the fishery on the coast of Africa. The staple export is wine (see CANARY WINE). The chief of the other exports are barilla, cochineal, orchilla, fruit, and raw silk. The *C.* are frequently visited by ships for fresh provisions, which, except vegetables, may be obtained plentifully in most of the islands. There is, however, no accommodation for ships except open roadsteads, which are unsafe in winter.

Canary Moss, a lichen used for dyeing, the *Palmeria perlata*.

Canary Seed, the seeds of *Phalaris Canariensis*, a native grass of Europe, which are given for food to cage-birds, and of which as much as 500 tons are annually sold for that purpose in England only. *Imp.* free.

Canary Stone, a beautiful yellow species of carnelian, rather rare, and named from the resemblance of its color to the plumage of a canary-bird.

Canary Weed. See ORCHILLA.

Canary Wine. The Canary Islands produce annually about 25,000 pipes of white wine for exportation, while 15,000 are consumed in the islands, or submitted to distillation. There has been a great corruption of names in these wines. *Canary* was once much drunk in England, and was known only by that name. The writer of this tasted some which was 126 years old, it having been kept during all that period in the family cellars of a nobleman with whom he happened to be dining. Its flavor was good, and it had ample body. What is called *Vidonia* (a corruption of Verdona, a green wine of good body, formerly grown near Santa Cruz) is properly the dry Canary wine, best known as *Teneriffe.* The Vidonia is a wine which greatly improves by age, especially in warm climates, resembling Madeira. The *Malmsey* of Teneriffe is small in quantity, but very rich and perfect in its kind; it was once in great repute. At Gomera, the wines improve so much by age that the dry kind gain the flavor of Madeira, and may be easily mistaken for it. In Palma, *Malvasia*, or Malmsey, is grown, which in a few years gains a bouquet like a ripe pineapple. The best wines do not grow much more than a mile from the sea. The *C.* wines are second to those of Madeira, which may be ascribed to want of care in the management of the vintage.

In the early voyages to the Canary Islands, quoted in Ashley's collection, there is a passage relative to *sack*, which will puzzle wise heads about that wine. It is under the head of Nicols's Voyage. Nicols lived 8 years in the islands. "The island of Teneriffe produces three sorts of wine, — Canary, Malvasia, and Verdona, — which may all go under the denomination of sack." The term, then, was applied neither to sweet nor dry wines exclusively, but to Canary, Xeres, or Malaga generally. In Anglo-Spanish dictionaries of the beginning of last century, sack is given as *Vino de Canarias.* Hence, it was Canary sack, Xeres sack, or Malaga sack.

Canary Wood, a name given to the wood of the *Laurus indica*, a native of Madeira, and *Laurus Canariensis*, a native of the Canaries. It is a fancy wood of a golden-yellow color.

Canaster, or C'NASTER, a kind of tobacco prepared for smoking from the dried leaves of the plant coarsely triturated, which derives its name from a particular kind of rush basket, in which it was formerly exported from S. America.

Can-Buoy, a large floating buoy.

Candareen, a Chinese weight, the 100th part of a tael, and containing 10 le, or cash. In accounts, the money value of the *C.* ranges from 10 to 14 copper cash; but as a weight, whether for silver or any other article, the le, or cash, continues to be the same integral part of the *C.* The *C.* may be estimated at 5¾ grains, although in some quarters of the East it weighs 6.38 grains.

Candelabrum, an ornamental metal stand, with branches for holding lights.

Canderos, an East Indian resin of a pellucid white, which, being susceptible of a good polish, has been turned into small ornaments and toys.

Candia. See CRETE.

Candied, dried with sugar. See CANDYING.

Candied-Peel, preserved lemon or citron peel, used for pastry or confectionery.

Candiota, the name for a barrel or keg in Spain; a large earthen jar.

Candle, is a wick covered with solidified oil or fat for giving light. No trade has undergone such revolutions as that of *C.* making. Formerly it was a mechanical occupation, but, since the researches of Chevreul and Braconnot into the na-

ture of the fats, it has developed into an important branch of scientific industry, chiefly in Europe, where there still exists a decided prejudice against the use of gas in private houses. *C.* are either dipped, moulded, or rolled. The cheapest sorts of tallow *C.* are formed by the first process, and wax *C.* by the last, all the other kinds being moulded. The moulds are tubes of pewter, well polished on the inside, eight or more being fitted into a frame, the upper part of which forms a trough to receive the melted *C.* material. When in the moulds, the *C.* are inverted; in other words, the bottom of each mould corresponds to the top of the *C.* The wick passes through a small hole at the lower extremity of the tube, and is held in the axis by a little bar placed across the top. When quite cold, the *C.* are withdrawn. The plan of pulling them out one by one with the aid of a bodkin has been superseded in large factories by the ingenious device of blowing them out with compressed air. The wick of a *C.* must be formed of very fine cotton. The use of the wick is purely mechanical; when lighted, it first melts the solid candle, which, being drawn by capillary action, is diffused over the fibres of the wick, and thus prepared for decomposition and combustion. The quality of the

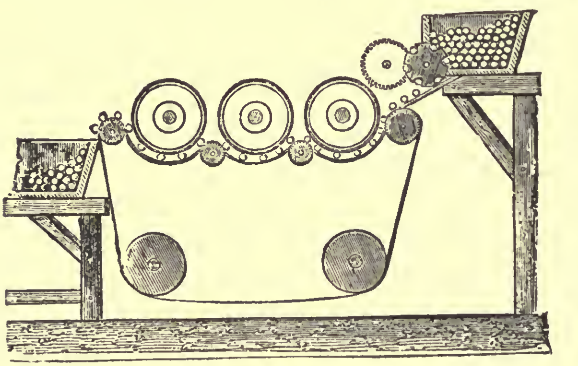


Fig. 56. — Wax-Candle Rollers.

C. depends very much upon the wick, as, if too thin, it will melt more than the fibres can decompose, and the candle will *run;* if, on the other hand, the wick be too thick, the *C.* will smoke, owing to the melted part not being in a perfect state of combustion for want of air at the centre of the wick. The wicks of the best *C.* are now made in such way that they do not require snuffing. This object is effected by causing the wick to bend over, and its end to fall outside, where it is exposed to the oxygen of the air. The best way to bring about this bending is by plaiting the cotton into a flat wick, which naturally takes the required curve. Such a wick is generally dipped into a solution of borax, which preserves it from being acted upon by the flame except at its extreme point at the edge of the flame. A very fine wire is sometimes included in the plaited wick.

Composite C., are mould *C.* formed of a mixture of the hard fatty acid obtained from palm oil and the stearine of cocoa-nut oil. Other compositions are occasionally used, such as a mixture of spermaceti and hard white tallow, to which a little bleached resin is added. — *Medicated C.* have been proposed as a convenient means of diffusing the active principles of certain volatile substances through the atmosphere, and for complete and partial fumigations. — *Paraffine C.* are made from the beautiful transparent substance paraffine. These *C.* surpass all others in elegance, and are entirely free from odor and greasiness. The light produced by 98 lbs. of paraffine *C.* is equal to that of 120 lbs. of spermaceti, or 138 lbs. of wax, or 144 lbs. of stearic, or 155 lbs. of the best composite *C.* They are sometimes delicately tinted with red, mauve, violet, crimson, and rose color. Aniline colors will not dissolve in paraffine. Stearic acid, however, is a solvent for them, and accordingly, when the *C.* are tinted with the coal-tar colors, these are previously dissolved in the stearic acid, always mixed with the paraffine. For coloring paraffine *C.* black, the paraffine is heated nearly to the boiling point with anacardium shells or nuts, which dissolve readily in the heated paraffine. Previous to the paraffine being made into *C.*, it is necessary that it should be purified and bleached, which is effected by digesting the paraffine at a temperature of 230° F. with about 12 per cent of powdered fuller's earth, agitating, and decanting when the fuller's earth has fallen down, the clear paraffine. Paraffine *C.* contain from 5 to 15 per cent of stearine, this addition being made for the purpose of diluting the paraffine, as well as for raising the melting point of the paraffine where this is low. The stearine, moreover, serves to preserve the rigidity of the *C.* in the candlestick, and to prevent its bending out of the upright position. Paraffine *C.* are always moulded, but previous to this being done the moulds must be heated to a temperature above the melting point of the paraffine; this may vary from 60°, 70°, and 87° centigrade, according to the paraffine employed. The moulds having been filled with the melted paraffine are, after one or two moments only, plunged into cold water, when the *C.* immediately becomes solid. Unless this were done the *C.* would be spoilt, owing to the crystallization of the paraffine. A thin wick is required for paraffine *C.* — *Spermaceti C.* are very delicate in appearance, but rather expensive. They burn well, but as the melting point of spermaceti is low, 120° F., they will not bear carrying about in the hand without guttering. They are generally adulterated with stearic acid or hard white tallow. Spermaceti is usually mixed with 3 per cent of wax or paraffine, to destroy its highly crystalline structure; it is moulded in the usual way, with plaited wicks that require no snuffing. Occasionally the spermaceti *C.* are cast without any admixture of wax, the moulds being raised to a higher temperature, just as with stearic acid. Some manufacturers, in order to make the spermaceti appear like wax, use gamboge to give the desired tint: such *C.* are known as transparent wax. — *Stearic* or *adamantine C.* include the various sorts of *C.* moulded from the hard fatty acids of both animal and vegetable origin. The principal sources whence manufacturers derive their acids are tallow, palm oil, and cocoa-nut oil. *C.* formed of the fatty acids can now be prepared so as to imitate and almost rival those of wax and spermaceti; and they are quite as cheap as the nearly obsolete mould *C.* formed of common tallow. They are extremely hard; they do not grease the hands; and they burn away brightly and steadily, without giving off any offensive odor. Uncolored, they are snowy white, but a yellow tint is frequently given them by gamboge. — *Tallow C.* are made from ordinary tallow, or from tallow which has been freed from much of its oleic acid by pressure. These have so unpleasant an odor, and are so apt to gutter, that they have almost entirely disappeared from use. — *Wax C.* are most frequently made by pouring melted white wax on to the wicks, which are hung upon frames, and covered with metal tags at the ends to protect the cotton from the wax in those parts. The frames are made to turn round, and melted white wax is poured down first one wick, and then the next, and so on. When the wicks have been subjected to this operation once, and have become sufficiently cooled, they have a second, and then a third coat given them, until they are of the required thickness. The *C.* are next rolled into proper shape between flat pieces of wet, hard-wood rollers (Fig. 56). The conical top is moulded by properly shaped tubes, and the bottoms are cut off and trimmed. Wax *C.* are now seldom moulded; but if so, the same processes are followed as for stearic and paraffine *C.* The large altar *C.*, which frequently weigh from 30 to 40 lbs., are made by hand. — *Wax Tapers*, are small wax *C.*, or rolls of wax, for office use. They are of various degrees of thickness, and are not made of pure wax, but of wax (usually vegetable wax) and tallow, the latter being added to give them flexibility. When they are required to be colored, resin and turpentine are added to the tallow.

Tallow and other *C.* are largely manuf. in the U. States. 1,567,265 lbs., valued at $218,985, were exported in 1878, chiefly to the West Indies and Central America. The trade sizes are usually 6's (or 6 to the lb.) and 8's (or 8 to the lb.), the lb. being about 14 ounces. They are most generally packed in 20 lb. boxes. *Imp.*, duty (adamantine and stearine), 5 cts. per lb.; (paraffine, spermaceti,

and wax, pure or mixed), 8 cts. per lb.; (all others), 2½ cts per lb.

Candleberry. See BAYBERRY TALLOW.

Candlenut, a trade name for the kernels of *Alearites triloba*, a plant growing in most tropical countries. The nuts, when dried and stuck upon a reed, are used by the natives of the Polynesian Islands as a substitute for candles. They contain a large amount of pure, palatable oil, which is sometimes used by artists as a drying oil.

Candlestick, the receiver or holder for a candle, which is made either of metal, glass, or earthenware; and of two shapes, tall or erect, or short, with a flat bottom.

Candle-Wick, a twisted length of cotton, round which the oil or fat is poured and solidifies. *Imp.* duty (wicks and wicking cotton), 35 per cent. See CANDLE.

Candied Fruits, are dry confections of fruit and sugar.

Candroy, a machine used in cotton-printing.

Candy, a preparation of sugar, made by melting and crystallizing it several times; a sweetmeat. — An Eastern dry measure of capacity and weight, which varies in different places. In Madras and Columbo it is equal to 500 lbs. avoirdupois; in Bombay and Mangalore, to 560 lbs. The Calicut *C.* is 640 lbs. For wool, coir, spices, and some other staples, in Bombay, the *C.* is 588 lbs. The Malabar *C.* is 695¼ lbs. The Surat *C.*, for many articles of merchandise, is 784 lbs.; and for some few, 821¼ lbs. The Mysore *C.* is equal to 560 lbs. Also a long measure of Malabar, equal to one cubic kole, or 28¼ inches.

Candying. When the object is simply to form a confection or sweetmeat, imbued with the aroma, flavor, or medicinal property of any substance, candies are generally prepared by simply boiling lump sugar with a sufficient quantity of the infusion, decoction, tincture, expressed juice, or sometimes even the powder, of the particular article, until a portion taken out and cooled becomes quite solid, when it is either poured out on a marble slab, or into tin, marble, or paper moulds, dusted with powdered lump sugar. When the object is to preserve the form and character of the vegetable in the candy, the substance is boiled in water until soft, and then suspended in concentrated syrup (in the cold), until they become transparent; after which they are either dried in a current of warm air, or in a stove, at a heat not exceeding 120° Fahr. The syrup must be kept fully saturated with sugar, by reboiling it once or twice during the process.

Cane, the common commercial name for many important grasses, embracing especially the varieties of the sugar-cane, bamboos, rattans, and Spanish, *C.* The stems of several small palms are also called canes. The several *C.* will be found described under their common special names. — The French name for a walking-stick.

Cane-Chair, a chair with a platted cane seat or bottom, or one framed with bamboo or other cane.

Cane-Juice, the juice of the sugar-cane, expressed between the rollers of a mill, or by hydraulic pressure.

Canella Alba, the commercial and botanical name of an aromatic tree common in the West Indies, sometimes called the wild cinnamon. The bark of the young branches, free from its outer rind, is imported in rolls or quills 2 or 3 feet in length, or in small broken pieces, and employed as a cheap stomachic. It has a bitterish, acrid, peppery taste. *Imp.* free.

Cane-Mill, a set of rollers for crushing the sugar-cane, which are either horizontal or vertical, and set in motion by steam, water, wind, or cattle power.

Canestra, the Italian name for basket.

Cane-Sugar, the juice obtained from the saccharine of the sugar-cane, reduced to a concrete state. See SUGAR.

Cane-Top Cutter, a machine for cutting the upper part or sprouting shoots of the sugar-cane for cattle.

Cane-Trash, the dead or withered leaves stripped from the stalk to enable the sugar-cane to ripen; also, the stalk after the juice has been expressed, used for fuel and manure, sometimes called *megass*.

Cangan, or KANGAN, a piece of coarse, Chinese cloth, thinly woven, 19 inches broad, and 6 yards long, which has a fixed currency value.

Cango, a common kind of litter or palanquin, used in Japan, something like a basket with a round bottom and flat roof, which is carried by three men.

Can-Hooks, two pair of flat hooks connected by ropes for hoisting barrels or light casks.

Caniater, a small box or case, usually of metal, for holding groceries, etc.

Canister-Powder, fine rifle or sporting powder, sold in tin canisters.

Canna, the wild plantain, a genus of plants belonging to the arrowroot family. One or more

Fig. 58. — THE WILD PLANTAIN.
(*Canna Indica.*)

species growing in the West Indies yield the *tous les mois*, a very pure and useful starch. The seeds of *C. Indica* (Fig. 58), found in the East and West Indies, and in South America, are commonly called *Indian shot*, on account of their black color and peculiar hardness. Its leaves are used as envelopes for many articles of commerce.

Cannabine, a narcotic gum-resin obtained from the East Indian plant *Cannabis sativa*.

Cannata, or CANNATE, a liquid measure of Greece = 2 82 pints.

Canned Goods, a general term for vegetables, fruit, or fish put up and preserved in air-tight tin cans.

Cannela-Wood, a beautiful cabinet-wood of Santa Catharina, Brazil.

Cannel-Coal, a dense and compact variety of bituminous coal, which breaks with an uneven or largely conchoidal fracture, and does not soil the fingers. The name is a corruption of the word *candle*, which has been applied to it in consequence of the bright flame with which it burns, or because the poor people in some places in the colliery districts of England sometimes use it instead of candles. It is called *Parrot-coal* in Scotland, from the way in which it crackles or chatters in the fire. Being hard enough to take a polish, it is sometimes made into ornamental articles like jet; but its principal value is as a gas-coal.

Cannelle, the French name for cinnamon.

Cannon, or GUN, a piece of ordnance of iron, bronze, or brass, for discharging balls, made of many sizes, according to the service required from it.

Brass or bronze *C.* are cast in loam moulds. A centre is formed of a wooden bar, with rope coiled round it, and then clay to a certain thickness. This gives shape to a mould or shell of loam, and then the centre is removed. The interior of the loam will give form to the exterior of the *C.* To produce any ornaments and inscriptions, small devices are modelled in wax, and fixed on the clay centre before the loam is applied; being melted out afterwards, their places form cavities on the inner surface of the mould, which will produce *relievo* ornaments on the exterior of the gun. When the moulds are ready, they are placed upright in a casting pit, and the molten brass passed into each by proper apertures. Some *C.* are, however, cast solid Iron *C.* are cast nearly in the same way as above described, with somewhat more powerful apparatus, on account of their usually large size. The names given to the different kinds of *C* are indefinite and confusing. Before the recent improvements made by Armstrong, Whitworth, Palliser, Fraser, Krupp, and others, *iron shell guns* were of 8, 10, and 12 inches bore; *iron mortars*, of 8, 10, and 13 inches bore; *iron howitzers* of 8 and 10 inches bore; *brass mortars* of 4 and 5 inches bore; *long iron guns*, 9, 12, 18, 24, and 32 pounders; *long brass guns*, 1, 3, 6, 9, and 12 pounders; *short iron guns*, or *carronades*, 12, 18, 24, 32, 42, and 68 pounders; *brass howitzers*, 12, 24, and 32 pounders. Some of the designations are now falling into disuse, and new forms of *C.* are quickly appearing. Whether a *C.* be cast in a mould, or made by coiling strips of wrought-iron or steel round a mandril, the interior requires to be made very smooth and regular; this is done by *boring*, sharp-cutting tools being used, and either the tools or the *C.* being made to revolve; far more elaborate working being needed when the bore is *rifled*. See RIFLE.

Cannon-Ball, CANNON-SHOT, a cast-iron ball to be thrown from cannon.

Cannon-Lock, a contrivance to place over a touch-hole of a piece of ordnance, to explode the charge.

Cannon-Metal, a brass alloy for casting ordnance from, containing 91 per cent of copper and 9 parts of tin.

Cannon-Shot, is properly the distance to which a cannon will throw a ball; but, in international law, the distance is fixed to a marine league from the shore, which is the limit of the territory, and therefore of the jurisdiction of the admiralty. A vessel taken within cannon-shot of a neutral fortress is not a lawful prize.

Canoe, a rudely formed boat, shaped out of the trunk of a tree by cutting or burning; also, a skin or bark boat used by uncivilized natives.

Canon, a large sized printing-type, formerly used for printing the canons of the Church, now principally in posting bills. — In Spanish, the shaft of a mine.

Canon-Bit, that part of a horse's bit that enters the mouth.

Canopy, a covering overhead; the decoration crowning a pulpit, chair, throne, bed, etc.

Cant, anything standing awry; timbers out of the perpendicular, or not fixed square.

Cantaloup, a small, esteemed variety of musk-melon.

Cantar, CANTARO, an old liquid measure of Spain, ranging from 2½ to 4 gallons; 100, however, may be taken as equal to 356 gallons. The name is also sometimes given to the alqueire or pot of Portugal. As a commercial weight in the Levant, the *C.* is synonymous with the quintal of Europe, being employed in the sale of ponderous commodities; but it varies considerably in different localities. In Syria, the ordinary *C.* amounts to 502¾ lbs.; the Maltese *C.* of 100 rottoli is 175 lbs. avoirdupois; in Smyrna, it is 127½ lbs.

Canteen, a tin case for holding food, etc., used by soldiers and others on the march; also, a place in barracks where provisions, liquors, etc. are sold.

Canterbury, a small ornamental music-stand, with two or three hollow-topped partitions, framed in light slips of mahogany, for holding music-books.

Canteroy, a weight for gold and silver, used in Bangalore, equal to 5.87 grains.

Cantharides, called also Spanish fly or blister-beetle, is an insect (*Cantharis vesicatoria*), found in the warmer parts of Europe, especially Spain and Italy. It is about three fourths of an inch long, of a bright green color, except the legs and antennæ, which are bluish black. They are used in medicine externally to raise blisters, and internally as a stimulant and diuretic, generally in the form of tincture. In excess they produce strangury, satyriasis, delirium, convulsions, and death. *Imp.* free.

Cantharidine, a crystalline principle obtained from the Spanish fly and other species of cantharides, powdered and steeped in an alcoholic tincture.

Canton. See CHINA.

Canton Tea, the lowest grade of green tea.

Cantoon, a kind of fustian, with a fine cord visible on one side.

Canvas, a coarse, strong cloth made of hemp, flax, or cotton, used for ships' sails, awnings, tents, etc., principally manuf. in Ireland and Scotland. *Imp.* duty (for sails), 30 per cent; (all others), 35 per cent; and 40 per cent when valued over 30 cts. per sq. yd. — Also, a light material woven with the warp and woof at intervals, so as to leave square interstices between them, and used by ladies for tapestry and Berlin-wool work. *Imp.* duty, 35 per cent. — Painter's canvas, on the contrary, is a material of very close texture, called "ticking." It is generally purchased stretched on frames of various sizes, and primed with a light neutral gray or drab tint ready for use. — The sails of a ship, taken generally.

Canvas-Back, a wild duck, the *Aythya vallisneria*, which arrives in the U. States from the north about the middle of October, and principally assembles in the numerous rivers in the neighborhood of Chesapeake Bay. It is highly esteemed by epicures for the delicacy of its flesh, and realizes a high price for the table.

Canvasser, one who solicits votes, or seeks support for any person, project, or publication.

Caoutchouc. See INDIA-RUBBER.

Cap, a cover for the head. Caps for ladies are made of lace, net, or some such light material; those for men are of cloth, fur, leather, and fancy materials, etc. — In ship-building, a thick, strong

block of wood with two holes through it, one square and the other round, used to confine together the head of a mast and the lower part of that next above it. — A cutler's term for a ring of metal surrounding a wooden wheel or lap. — See PERCUSSION CAP.

Capa, a term in Cuba for good tobacco, the best or outside leaves being suited for the wrappers of cigars.

Capacity, the power of containing, the extent of room or space in a vessel or cask.

Cape, a lady's article of dress; that part of a garment which covers the shoulders, as the *C.* of a cloak, coat, and the shoulder-trimmings of a dress.

Cape Aloes. See ALOES.

Cape Breton, an island of the Dominion of Canada, separated from the N.E. extremity of Nova Scotia, of which province it is a part, by a narrow, navigable channel, called the Gut of Canseau. It forms the S.E. boundary of the Gulf of St. Lawrence, and lies between 45° 27′ and 47° 4′ N. lat., and 59° 45′ and 61° 38′ W. lon.; area about 4,000 sq. m. It is penetrated by a mediterranean sea, called the Bras d'Or, which divides it nearly into two parts. Sydney, the capital, on the N.E. side, carries on a considerable trade in coal, extensive mines of which exist in the neighborhood. Pop. 75,483.

Capelin, a small migratory fish of the North American seas, somewhat resembling the smelt. It is caught by the Newfoundland fishermen, dried, and packed chiefly for the English market.

Cape of Good Hope, or CAPE COLONY, a British colony composed of the portion of Africa lying between the Southern Ocean and about lat. 29° S. The boundary is not accurately defined, having been gradually enlarged by the annexation of surrounding districts. The most important of these annexations were that of British Kaffraria in 1866; of Basutoland, at the head of the basin of the Orange river, in 1868; of two vast but partly unexplored districts called Fingoland and Nomansland, or Griqualand East, in 1875; of Griqualand West in 1876; and of the Transvaal in 1877. According to government returns published in 1877, the actual area is 347,855 sq. m., and the total pop. 1,420,162. The European inhabitants consist in part of the English authorities and English settlers; but the majority are of Dutch, German, and French origin, mostly descendants of the original settlers. The colored people are chiefly Hottentots and Kaffirs; the remaining portion of the pop. consists of Malays, and so-called Africanders, the latter offspring of black women and Dutch fathers. Very little communication takes place between the Kaffirs, Africanders, and Malays, each race holding the others in contempt. The administration of public affairs is vested in a governor, aided by executive and legislative councils.

The Cape Colony is in general rugged and barren, and deficient in the means both of internal and external communication. But a portion of the E. coast is of a different character, more especially towards the N.E. frontier, including the district of Albany, where the country is well wooded and watered, and favorable for agriculture and grazing. The W. coast, and a great portion of the rest of the country, consist of barren mountains and arid plains, one of which, the Great Karroo Desert, a high parched table-land, separating the Cape Town District from the finer country to the N.E., extends about 100 leagues in length, from E. to W., and 30 in breadth. The climate, however, is one of the finest in the world; and were the aridity of the soil counteracted by irrigation, and the means of intercourse improved by the formation of roads, the character of the country would be very different, as the capabilities of the soil are naturally great. The only parts thickly settled are the Cape and Stellenbosch districts, which contain about three eighths of the whole population, some parts of Worcester, Graaf Reynet, the British settlements at Graham Town and Bathurst, in Albany, and some parts of the Transvaal, in which the discovery of diamonds has, of late, attracted about 30,000 settlers; the other portions are occupied chiefly by Dutch graziers, called *Boors*. Nearly 250 acres are under crops, yielding annually about 600,000 bushels of wheat, besides small quantities of barley, oats, and rye; the remainder of the productive surface is chiefly pasture land. The sheep farms are often of very great extent, comprising from 3,000 to 15,000 acres, and upwards; those in tillage are comparatively small. The vine is grown within 40 m. round Cape Town; but the wines, except that made at Constantia, near Table Mountain, are almost all of very low quality. The commercial intercourse of the Colony is mainly with Great Britain. Among the articles of export, wool is the most important, the value shipped annually constituting nearly nine tenths of the total export. In 1877, it amounted to 32,912,225 lbs., valued at $11,121,350. Among the minor exports are copper ore, ostrich-feathers, and sheepskins. There were in 1879 three lines of railroad open for traffic, of a total length of 526 m.: the Western, from Cape Town to Worcester; the Midland; and the Northwestern, starting from Port Elizabeth. The progress of the Colony has been almost continually, and down to the present time materially, impeded by wars with the Kaffirs. The ports are few. *Cape Town*, the capital and seat of the government, is on the S.W. coast and S. shore of Table Bay, at the foot of Table Mountain, about 32 m. from the Cape of Good Hope, lat. 33° 56′ S., and lon. 18° 1′ E. It is capable of containing any number of ships, and is on the whole a good harbor, except during the months of June, July, and August, when it is exposed to the heavy swell from the W. Pop. 29,082. *Port Elizabeth*, in Algoa Bay, is the shipping-place for the E. part of the Colony.

Money, Weights, and Measures. The coins in circulation within the Colony are exclusively British. All accounts are kept in pounds, shillings, and pence. The standard weights and measures are British, except the land measure, which is the old Amsterdam *Morgen* = 2.11654 acres.

Capercailzie, a Scotch name for the wood grouse.

Capers [Fr. *capres*; It. *cappari*], the flower-buds of various species of *Capparis*, particularly *C. spinosa*, the caper-tree, preserved in vinegar. They are chiefly imported from Spain, Italy, and the South of France, where the tree is largely cultivated for the purpose. The so much esteemed bright green color of the *C.* arises chiefly from the presence of copper derived from the sieves used in sorting them, and is injurious to health. The condiment tastes better without it. *Imp.* duty, 35 per cent.

Caper Spurge, the *Euphorbia lathyrus*, the seeds of which yield an abundance of pure, clear cathartic oil.

Caper Tea, a black tea, a superior kind of souchy (or sunglo) with a knotty, curled leaf; so named from its fanciful resemblance to the caper. That sold in London is usually scented with chloranthus, jasmine, or other flowers.

Cape Verde Islands, a group belonging to Portugal, situated in the N. Atlantic Ocean, about 370 m. W. of Cape Verde in Africa, between lat. 14° 20′ and 17° 20′ N., and lon. 22° 20′ and 25° 30′ W.; area, 1,650 sq. m.; pop. 76,003. Although of small extent, mountainous, and unproductive, the islands are estimated the most important colonial possessions of Portugal, politically and commercially. There are nine principal or inhabited islands. Five of these, viz. St. Nicholas, Bona Vista, San Antonio, St. Vincent, and Sal, compose the windward, and the four remaining islands, St. Jago, Fogo, Brava, and Maio, the leeward group. Placed as these islands are, in the direct route of steamers bound from Europe to the coast of Brazil, the River Plate, and the W. coast of South America, they are of great value as affording a convenient resting-place for coaling and renewing provisions and water. The climate, however, is exceedingly unhealthy. The island of St. Vincent, 170 sq. m. in extent, but with not more than 1,700 inhabitants, is possessed of a deep and excellent harbor, affording a secure anchorage at all seasons for vessels of the largest size. Porto Praya, in St.

Jago, is the residence of the governor-general, whose administration extends over these islands and the Portuguese settlements of Senegambia.

Cape-Weed, a commercial term for a dye lichen, the *Rocella tinctoria*, imported from the Cape Verde Islands.

Cape Wines, the product of the vineyards of the Cape of Good Hope, are, except the Constantia, red and white wines of the worst description, being generally infected with the earthy taste common to wines grown on bad soils. Some are sweet, but the larger part are dry. They are called *Cape Madeira, Cape Sherry, Cape Hock*, etc. The *Constantia* wine, so much celebrated among the luscious wines, is grown in the vicinity of Cape Town, and so called from the farm on which the small vineyard stands. The produce of the red and white Constantia does not exceed 80 or 90 pipes. This wine has been much overrated.

Capillaire [Fr.], a pharmaceutical name for a simple syrup, or a concentrated solution of sugar in water, or some other similar aromatic. The name was originally given to a mucilaginous syrup, prepared by adding to an infusion of maiden-hair (*Adiantum capillus veneris*) some sugar and orange-flower water.

Capin, the 8th part of a bahar, an Eastern measure, about 60 lbs. advoirdupois.

Capital, the amount of money or property subscribed or employed in a joint-stock company; the money assets invested in business by a trading firm or individual; the net worth of a party. — In political economy, the accumulated savings of industry, capable of being employed either for the support of human existence, or as an instrument of production. It is distinguished into two sorts, arising from a difference in the mode of applying it. *Fixed C.* consists of those articles of a durable nature which contribute to the production without being destroyed. Such are roads, canals, houses, docks, harbors, warehouses, and those tools, machines, and other accommodations which do not perish in the using. *Circulating C.* possesses this distinctive character, that it is necessarily consumed in contributing to production, and that it must be reproduced in order to enable the producer to continue his operations. Of this nature are food, coal, seed, wool, clothes, some kinds of tools, and all other articles subservient to production which perish in the using. These terms are not, however, always very definite. Thus, the lower animals are in some cases to be regarded as fixed, in others as circulating capital; oxen used permanently for draught belonging to the former, but when reared solely for the market, to the latter. It follows, necessarily, if the instruments of labor, the materials on which it is employed, and the subsistence of the laborer, are all included under the name of *C.*, that the productive industry of every country is in proportion to its *C.*, increases when its *C.* increases, and declines when its *C.* declines. It is obvious that when there are more instruments of labor, more materials to work upon, and more pay for workmen, there will be more work, provided more workmen can be obtained. If they cannot, two things will happen: wages will be raised, which, giving an impulse to population, will increase the number of laborers; while the immediate scarcity of hands will whet the ingenuity of capitalists to supply the deficiency by new inventions of machinery, and by distributing and dividing labor to greater advantage. *C.*, according to the sense in which the term is generally used in commerce, does not differ essentially from that now explained. It comprehends in addition the debts due to traders; but in estimating *C.* in the aggregate, those must evidently be neglected, as what constitutes an article on the credit side of the books of one class of men forms an exactly equal item of debt in the books of others. The ratio of the accumulation of *C.* depends upon the degree in which production annually exceeds consumption. Accumulation is facilitated by the abatement of taxes, and by the removal of all impediments to the free employment of the *C.*, labor, and skill of a nation. It is also increased by whatever tends to economize the consumption in the different branches of industry, and by the prevalence of frugal habits, — objects which only can be secured by basing professional skill of every sort upon real knowledge, by the enlightenment of the people, and above all by the predominance of pure and simple tastes and sound morals.

Capital Letters, in printing, are types used at the head of a paragraph or sentence of printed matter, of a larger size than those forming the body of the page, and of different form.

Fig. 59. — Capsicum Annuum.

(*Cayenne Pepper.*)

Capitalist, a man of large property, one who has a considerable sum invested in the funds or in stock in trade; one who has surplus pecuniary means which he can invest at pleasure.

Capitalize, to add the interests or profits to the capital; to convert into capital or shares.

Capivi. See Copaiva.

Capoc, a fine, short-stapled cotton-wool, used in India for stuffing cushions, lining palanquins, etc.

Capon, a young cock gelded to fatten for the table.

Capoor Kitchely, or Kapoor Kuchree, an aromatic drug of the Indian markets, the rhizoma of *Hedychium spicatum*.

Capote, a long cloak for females; a great-coat with a hood worn by soldiers on guard.

Cappadine, a sort of silk flock or waste obtained from the cocoon after the silk has been reeled off and used for shag.

Cap-Paper. See Foolscap.

Cap-Peak, the front part of a man's cap, the shade over the eyes, that part which is ordinarily taken hold of to remove it from the head.

Capellaio, the Italian name for hatter.

Capping, ridge or roll metal, galvanized iron, etc., for roofing.

Capsicum, a genus of plants producing pungent capsules of various shapes, which are very generally used as seasonings and condiments. The pods of *C. annuum* (Fig. 59) and *C. baccatum* of the East and West Indies, pounded, furnish the cayenne-pepper of commerce. It is employed medicinally, but is chiefly used as a stimulating condiment, being an essential ingredient in curry-powder. In taste it is very fiery and acrimonious; its color is reddish. *Imp.* duty (ground), 10 cents per lb.

Cap-Spring Maker, a maker of metal springs fitting to the head for ladies' caps, for flowers, wreaths, etc.

Capstan, a cylinder or truncated cone of wood, placed vertically in the deck of a vessel, moved by levers or hand-bars; chiefly used for weighing anchor, hoisting yards, sails, etc., or any purpose in a ship where great purchase is required. A windlass is a sort of horizontal *C.* in the fore part of the ship.

Capsule, the seed-vessel or dehiscent fruit found in several large orders of plants, many of which enter into commerce, as poppy-heads, capsicums, cardamoms, etc. — The metallic seal or cover for closing a bottle. — A small egg-shaped or spherical vessel, in which a medicine is placed, for the purpose of covering its nauseous taste at the time of swallowing it. They are commonly made of gelatine, mixtures of gelatine and sugar, or animal membrane.

Gelatine C. are made by dipping the bulbous extremity of an oiled metallic rod into a strong solution of gelatine. When the rod is withdrawn, it is rotated, in order to diffuse the fluid jelly over its surface. As soon as the gelatinous film has partially hardened, it is removed from the mould and placed on pins, furnished with suitable heads, and fixed on a cork table. When sufficiently dry, the *C.* are placed upright in little cells, made in the table to receive them, and the liquid with which they are to be filled is then introduced by means of a small glass tube. They are next closed by dropping some of the melted gelatine on the orifice of each. Six parts of gelatine, and one part sugar are now the common proportion.

Captain, the commander of a ship of war. The term is also generally applied, by courtesy, to the master of a merchant-vessel. See Master.

Capuchin, a cloak with a hood worn by females.

Car, in its original sense, is a small vehicle that runs or moves on wheels. In the U. States, the term is commonly applied to a passenger vehicle running upon rails. The *Irish car* is a one-horse cart, with very low, broad wheels, used for carting out manure, and carrying home grain, in the case of soft, peaty soils. The *Irish jaunting-car* is a kind of low, one-horse chaise, commonly without springs, in which the people sit back to back, and with their faces looking sideways. See Railroad Car.

Caracoly, an alloyed metal of gold, silver, and copper, of which rings and trinkets are made, intended for shipment to quarters where the natives are not able to test the intrinsic value of the material.

Caracter, a Spanish apothecary's weight, = 3 grains.

Carafe [Fr.], a glass water-decanter for the table.

Caraffa, the Italian name for a flagon or bottle.

Carafon [Fr.], a small decanter; a half-pint.

Caragi, a Turkish name for import and export duties.

Caraila, Caravela, are East Indian names for the small, black, aromatic seeds of *Cleome pentaphylla*, which are used medicinally by the natives in decoction as a stimulant.

Carambolas, a name given by the Portuguese to the fruit of *Averrhoa carambola*, much used to make tarts. The British call them Coromandel gooseberries. The fruits are used medicinally, in dyeing, and for various economical purposes.

Caramel is a dark-brown substance, obtained by heating sugar. It is formed during the roasting of all materials containing sugar, such as coffee and malt. It is much used for coloring soups, wines, spirits, and other liquids. *Crude C.*, also called *spirit coloring*, and *burnt sugar*, is made from cane sugar, by heating it to from 410° to 428° F., as long as aqueous vapor is formed, dissolving the product in water, and concentrating the solution by evaporation. To obtain *pure C.* crude *C.* is placed on a parchment-paper dialyzer. The undecomposed sugar, and certain intermediate compounds, diffuse out with considerable facility, and what ultimately remains on the dialyzer possesses five times the coloring power of the original crude *C.*, weight for weight.

Carat, or Karat, a term used in a relative sense to express the fineness of gold. It means the 24th part of any given weight of that metal or of its alloy. If such weight be pure gold, it is said to be 24 carats fine; if three fourths only be gold, it is said to be 18 carats fine. The diamond carat, however, is a definite weight = $3\frac{1}{8}$ troy grains; and the pearl carat = $\frac{1}{4}$ of a troy grain. The carat was originally the 24th part of the old marc, or half-pound of the French.

Caratello, the Italian name for a keg for liquor.

Caravan, a troop or body of merchants or pilgrims, as they travel with camels in the East. The Koran, as is well known, enjoins every Mussulman, who has the means, to perform a pilgrimage to Mecca once at least in his life. Dulhadja, as the name imports, is the month in the Mohammedan calendar peculiarly set apart for the performance of this solemnity. Formerly, when devotional zeal was more ardent, the difficulties of the journey through the desert were held to increase the merit of the act; but of late a considerable portion of the hadjis do not travel by land with the caravans, but arrive by sea at Jidda. The regular hadj-caravans are six or seven in number, though they do not always make their appearance together, nor even perform the visit annually. One caravan proceeds from Syria, consisting chiefly of pilgrims from the Turkish empire. Another, issuing from Cairo in Egypt, conducts the Mogrebin, or African hadjis. A third caravan arrives from Bagdad with Persian pilgrims; and two smaller caravans go from Lahsa and Oman, besides a separate company of pilgrims from Yemen. The principal is that from Syria, which used to be accompanied by the Caliph in person. During the whole route, it is attended from town to town by the armed force of the district, and from Damascus to Medina it moves with great pomp across the desert, — a journey of 30 days. The Pasha of Damascus, or one of his principal officers, always escorts it; and the different classes of hadjis are stationed according to their town or district. At every stage (or distance of 11 or 12 hours' march) is a storehouse for provisions, with a small garrison, and a large tank at which the camels receive water. The usual time of travelling is from 3 o'clock in the

afternoon to an hour or two after sunrise next day, — torches being lighted during the night. The pomp and magnificence of this moving solemnity are still considerable, though much diminished since the time of the Caliphs, both in point of splendor and attendance. In 1814, the Syrian caravan, which was reckoned small, amounted only to 4,000 or 5,000 persons, attended by 15,000 camels. But of late years the numbers are understood to have increased, owing to the greater security afforded by the Pasha of Egypt against the Bedouins and Wahabees. Most of the pilgrims undertake the tour with a view to profit. Some accompany the caravan as soldiers; some are pilgrims by profession, and are paid to perform the sacred journey for others; and except mendicants, almost every hadji combines mercantile adventure with his religious duties. So much is this now the case, that the annual assemblage of Mecca, instead of a religious ceremony, may be more properly regarded as the principal Eastern fair for the exchange of the productions of Asia, Africa, and Europe. The Mogrebins bring their red bonnets and woollen cloaks; the western Turks, shoes and slippers, hardware, embroidered stuffs, sweetmeats, amber, European trinkets, and other small wares; the Anatolians bring carpets, silks, and Angora shawls; the Persians, cashmere shawls and large silk handkerchiefs; the Afghans, plain coarse shawls, beads, etc.; the Indians import the numerous productions of their rich and extensive regions; the people of Yemen bring sandals and various articles in leather; and of late years an increased quantity of European manufactures are carried there through various channels. Besides the religious caravans, there are many others which travel betwixt various places, both in Africa and Asia. Thus the intercourse between Egypt and Barbary and the interior of Africa is conducted by means of these associations; the trade between Russia and China is likewise a caravan trade, as is that between Aleppo and Bassora, and Bagdad. Similar lines exist in the countries to the E. of the Caspian; and others on a smaller scale are constantly occurring at various places where travellers and others assemble and organize an expedition for their mutual safety, one of their number being elected to regulate the order of march, and others to adjust disputes.

Caravansary, and CARAVANSERA, a large public building, or inn, for the reception and lodgment of caravans in the desert. Though serving instead of inns, there is this essential difference between them, that the traveller finds nothing in the *C.* for the use either of himself or his cattle, but must carry all his provisions and necessaries with him. *C.* are also numerous in cities, where they serve not only as inns, but as shops, warehouses, and even exchanges.

Caraway [Fr. & It. *carvi;* Ger. *Feldkümmel;* Sp. *alcaravea*], a biennial umbelliferous plant (*Carum carui*), cultivated in many parts of Europe, chiefly for its seeds, which are used to a considerable extent in confectionery; also, for flavoring cheese, spirits, and liqueurs, and in medicine. The seeds have an aromatic smell, a warm pungent taste, and yield much essential oil. They are largely imported from Holland. *Imp.* (seeds and oil), free.

Carbine, a small short-barrelled gun, carried by mounted troopers.

Carbolic Acid, also called *Phenic acid* and *Phenol*, a powerful antiseptic substance, obtained from coal-tar oil. The pure anhydrous acid is in long, colorless, prismatic crystals, often, however, on keeping, turning a beautiful pink, rose, or crimson, and which rapidly deliquesce in moist air, becoming converted into a colorless refractive liquid, having a faint odor of roses and tar. At 95° F. they become an oily liquid, having an odor and taste like creosote. Sp. gr. 1.065, boiling point 370° F. Exposed to the air, the crystals absorb moisture and liquefy. The acid is slightly soluble in water, but freely soluble in glycerine, alcohol, and ether. *C.* acid is poisonous. As a medical agent, it seems to have all the useful properties of creosote in an exalted degree, with some peculiar actions of its own. It is used as a disinfecting wash for ill-conditioned ulcers and gangrenous sores, etc.; also, in the preparation of picric acid, and of dyes. *Imp.* duty (for chemical or manuf. purposes), free; (dry or liquid, medicinal), 10 per cent; (as a disinfectant), 20 per cent.

Carbon, an elementary or simple non-metallic solid body, very widely diffused through nature. Its purest and rarest form is that of the diamond. Nearly pure, it occurs very abundantly in the forms of graphite and anthracite. In combination with oxygen, as carbonic acid, it exists in the atmosphere, and in the waters of most springs; also in limestone, marble, chalk, and dolomite. Combined with hydrogen, it enters largely into coal, peat, and lignite. It is an essential constituent of organic matter, and hence it has been termed the "organic element." *Charcoal*, *lamp-black*, and *coke*, are more or less pure forms of carbon. By strongly igniting lamp-black in a covered crucible the element is obtained sufficiently pure for most chemical purposes. It is best obtained purest by burning a jet of pure olefiant gas in an atmosphere of pure chloride, collecting the amorphous *C.* deposited, and igniting in vacuo at a red heat. *C.* combines with other substances in numerous forms. With oxygen it constitutes *Carbonic acid*, purposely made in preparing aërated bread, soda-water, etc. This carbonic acid, combined with metals, earths, and alkalies, produces the substances known as *carbonates*, so invaluable in the arts. When *C.* combines, not with oxygen, but with other simple substances, it produces *carburets* instead of carbonates. These, in the solid form, are not to any large extent useful; but the gaseous compound of carbon and hydrogen, forming *carburetted hydrogen*, may be taken as the type of all our most important materials for artificial heating and illumination. *Imp.* duty (pure), 20 per cent; (animal *C.*, crude, or burned bones), free.

Sulphide or *Bisulphide of Carbon*, a colorless, pungent, fetid liquid, having the sp. gr. 1.27. It is exceedingly volatile, boiling at 118.5° F., and has never been frozen. It is highly inflammable, burning with a pale-blue flame, and giving off sulphurous and carbonic-acid gases. It freely dissolves sulphur and phosphorus, and by spontaneous evaporation deposits the first in beautiful crystals. The solution of phosphorus is much used in electrotyping objects, which are coated with a conducting film by its means. Its refractive power is remarkably high, and on this account it is employed to fill hollow lenses for spectroscopes and other optical instruments. It produces intense cold by its evaporation. A spirit thermometer, having its bulb covered with cotton, if dipped into this fluid and suspended in the air, rapidly sinks from 60° to 0°, and if put into the receiver of an air-pump it will fall to —81° F. A mixture of sulphide of carbon and solid carbonic anhydride forms almost the most powerful frigorific agent known. Sulphide of carbon is now prepared on a large scale, and extensively em-

ployed as a solvent, and as a disinfectant. *Imp.* duty, 20 per cent.

Carboy, a large green-glass bottle, cased in basket-work, varying in size from five to ten cubic inches, used for carrying distilled waters or liquid acids of too powerful nature to be carried in casks. *Imp.* duty, 35 per cent; American, reimported, free.

Carbuncle, or ALMANDINE, a fine large garnet cut with a rounded face. *Imp.* duty, not set, 10 per cent; set, 25 per cent.

Carcanet, a chain or collar of jewels.

Carcass, the dead body of an animal. — An iron shell fired from a mortar during sieges, to set fire to buildings in the besieged town. It is hollow, 4 to 13 inches in diameter, and is crammed with an infernal mixture of gunpowder, saltpetre, sulphur, pitch, resin, turpentine, and tallow.

Carcavellos Wine. See OPORTO WINES.

Carcel Lamp, a lamp of French invention, in which the oil is wound up by a kind of clock-work pump, which forces it up to the wick. The real carcel principle is very scientific, but is seldom acted upon, as the lamps are very expensive, and are liable to get out of order. The *Moderator lamp* (Fig. 60) is almost as effective as the carcel, without being so costly and so delicate. A spiral spring, acting upon a piston, tends to press it constantly downwards, and to force up oil from beneath the piston through a small tube to the wick. Subsidiary apparatus insures the renewal of a supply of oil beneath the piston, the return to the vessel of any oil which overflows the wick, and the regulating or "moderating" according as the tension of the spring increases or diminishes.

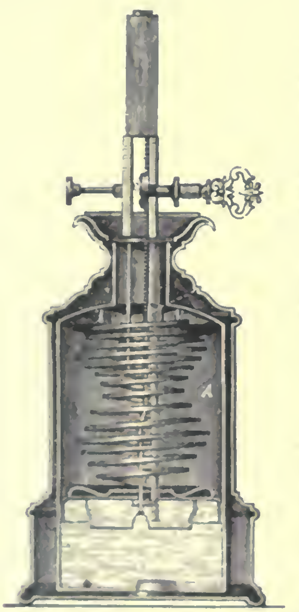


Fig. 60. — MODERATOR LAMP.

Cardamoms [Fr *cardamomes*; Ger. *Kardamom*; It. *cardamomi*; Sp. & Port. *cardamomos*], the capsules of various not very clearly defined species of *Amomum*, *Elettaria*, and other plants, *Elettaria cardamomum*, however, furnishing the true officinal Malabar *C.* The cardamom is an obtusely triangular three-celled pod, about half an inch in length, of a pale straw color, and furrowed longitudinally on its outer surface. This pod contains numerous reddish-brown rugose seeds, about the size of mustard-seeds, internally white, and having a pleasant aromatic odor and an agreeable taste. *C.* are principally employed as a flavoring ingredient, and occasionally as a stimulant and carminative, especially in the form of a simple or compound tincture. In India they are much used as a favorite condiment for various kinds of food, as curries, ketchups, and soups. Their active principle is a pungent volatile oil. They are shipped to England from Ceylon, Sumatra, Java, Siam, and the Malabar coast. *Imp.* free.

Card, a small piece of card-board, on which are printed or engraved the name, business, and address of a mercantile house: commonly called *business card*. See PLAYING-CARDS.

Card-board, a very stiff paper substance, or pasteboard, for cutting cards from, for making boxes and for other uses. *C.*, for playing and address cards, consists of cartridge-paper with finer paper on the two surfaces. *Bristol board* consists of fine paper throughout its whole substance. *Mill-board* is made of coarser and heavier paper, but is rendered smooth and glossy by heavy rolling. Pasting, pressing, drying, and rolling are the chief processes in the manufacture of all the varieties. Some *C.* is *enamelled* by means of a very fine preparation of white lead, rubbed on, and brushed in a peculiar way.

Card-board Cutting-Machine, a machine which cuts card-board into slips of a uniform size, and sometimes prints and numbers them for railroad tickets or other purposes.

Card-Box, a box for keeping playing cards in.

Card-Case, a portable fancy case for holding visiting-cards.

Carder, one who combs or clears wool or flax.

Cardinal. See BISHOP.

Carding-Machine, a mechanical engine in which the fibres of cotton are combed or carded, to disentangle them from each other, and bring them into a proper condition for spinning into yarns and thread. These machines consist of wooden cylinders or drums to which strips of leather are fastened, which are perforated with numerous wires regularly arranged. The wires are short and stiff, and the exterior of the cylinder resembles a circular brush. Several such cylinders are arranged so that the ends of the teeth are nearly in contact; and the cotton being brought to them, is caught up, passed from one to the other, and combed out as the cylinders revolve in the form of beautiful films or fleeces, which are removed by a smaller drum-card, called the *doffer*, and again from this by the *doffing-knife*. These films, which are of the width of the drum, are next contracted to a narrow ribbon, by being passed through a funnel; and thus narrowed, are called the *card ends* or *slivers*, and are now ready for the next process of *drawing* or *doubling*.

Cardole, a thick black oily substance obtained in the East Indies from the pericarp of the marking-nut. It is a powerful vesicating agent.

Cardoon, a culinary plant, the *Cynara cardunculus* (Fig 61), resembling the artichoke, but larger; the blanched stems of the young leaves are stewed or used as an ingredient in soups in Germany and France.

Card-Rack, a receptacle for address, visiting, or business cards.

Cards are metal teeth fixed in an elastic band for teasling and separating the fibres of wool. See CARDING-MACHINE.

There is a beautiful engine, Crabtree's *Wire Card Setting Machine*, which inserts all the wires in the cards by self-acting movements. Wire is fed into the machine, and also the fillets which are to form the cards The wire is cut into short pieces; each piece is held firmly, and the two ends bent to form a staple; a pricker makes holes in the fillet. the pieces of wire are inserted in the holes; while supplementary parts give force and finish to the teeth thus made The fillet travels on just as fast as those operations are completed.

Card-Table, a light folding-top table covered with baize, for playing cards on.

Card-Tray, a small salver for a servant to deliver a card on.

Card-wire Cloth, cloth in which fine iron wire is inserted for combing and disentangling the fibres, etc. of wool, cotton, flax, and hemp.

Fig. 61. — CARDOON.

(*Cynara cardunculus.*)

Careen, to heave a ship down on her side in order to examine her bottom, for cleaning or paying it with pitch. — When a vessel lies over with the wind in sailing, she is said to careen.

Careenage, a careening ground, a place suitable for placing a ship high and dry.

Carga, a standard Spanish liquid measure, equal in some parts of that kingdom to 32¾ gallons, but in others only 27½ gallons; also a Spanish weight, ranging from 177½ lbs. to 338½ lbs. — In Candia and Milan the carga as a grain measure is equal to 4⅙ bushels. — A commercial weight in Central America equal to 81 lbs.

Cargo, the load carried by a ship or merchant-vessel; the freight; the goods, merchandise, lading, or whatever is carried by a ship (human beings excepted). That which cannot be stowed in the hold is termed *deck cargo.*

Cargo-Boat, a luggage-boat or barge for the conveyance of heavy goods on rivers or in harbors.

Cariole, a small, light, open carriage for general use.

Carlings, short, small square pieces of timber which lie fore and aft in a ship, in tiers from beam to beam, and which receive the ends of the ledges for framing the decks.

Carlock, a kind of isinglass obtained from the air-bladder of the sturgeon in Russia.

Carman, a carter, cartman, or drayman; one who drives a cart. A carman who carries goods for hire as an employment is a COMMON CARRIER (q. v.).

Carminatives are medicines that allay flatulency and spasmodic pains. Among the principal *C.* are *aniseed, caraway seed, cardamoms, cassia, cinnamon, ginger, peppermint,* and the *peppers.*

Carmine, VEGETABLE SCARLET, a beautiful red pigment prepared from the cochineal insect. Pure *C.* is a very light, lustrous, scarlet powder, entirely soluble in ammonia, a test by which its purity is readily determined. It is used as a pigment in velvet and miniature painting, and for tinting artificial flowers, and as rouge for the complexion. The powdered cochineal (carmine grounds), from which the colored liquor (liquid rouge, carmine liquor) has been decanted, is used by the paper-stainers, and both are used in the preparation of carminated lake. *Imp.* duty, 35 per cent.

Preparation. From cochineal 1 lb., and carbonate of potash ½ oz., boiled in water, 7 gals., for 15 minutes; the vessel is then removed from the fire, and powdered alum, 1 oz., added; the liquor is then well agitated and allowed to settle for about 15 minutes longer; the clear liquid is next decanted into a clean copper, and isinglass, ½ oz., dissolved in water, 1 pint (and strained), added; as soon as a coagulum forms upon the surface, the heat is removed, and the liquid is strongly agitated with a bone or silver spatula, after which it is allowed to repose for 20 or 30 minutes. The deposited *C.* must be drained on a filter, and dried on shallow plates covered with silver paper. — *Liquid C., Rouge liquid, C. ink,* is a solution of *C.* in ammonia water, or spirits of hartshorn. It is very rich and beautiful. — *Blue C.*, see INDIGO.

Carnauba Root, is the root of the palm (*Corypha cerifera*), growing on the shores of the Rio Francisco, in Brazil. The leaves yield a vegetable wax, which is made into candles; the fruit is eaten raw, or boiled; a farina is obtained from the trunk, and the wood is very durable.

Carnelian, an ornamental stone, so called because some kinds are of a flesh color, is a variety of agate or chalcedony. *C.*, when recent, is dark olive-green, inclining to greenish gray; but, by exposure to the sun and calcination, it becomes generally of a reddish color, though sometimes yellow or white, the deep, clear red being, however, the most valuable. They are never figured or striped. The great supply is from Japan. They are also imported from Bombay; but the best come from the Gulf of Cambay. Many of the antique gems are engraved in *C. Imp.* duty, unmanuf., free; stones, 10 per cent; rings, 25 per cent.

Carnet, in French commerce, a bill book.

Carnucci, dried skins and hide pieces, for making glue, exported from Sardinia.

Caroba, in Tunis, the 16th part of a piaster = about 3 cents.

Carob-Beans, ST. JOHN'S BREAD, ALGARROBO, the leguminous pods of the carob-tree, *Ceratonia siliqua*, which contain a succulent, sweetish pulp, and are often eaten in Spain and the countries bordering on the Mediterranean. They were once supposed to be the locust bean on which St. John the Baptist fed when in the wilderness. Most of the carob-beans imported into this country come from Sicily and Naples. They are occasionally sold to singers under the impression that they improve the voice. They are largely imported into England for feeding cattle. *Imp.* free.

Caroteel, the commercial name for a tierce or cask, in which dried fruit and some other commodities are packed, which usually averages about 7 cwt.

Carp, the *Cyprinus carpio*, a fresh-water fish of Europe and Asia, 1 to 3 ft. long, very tenacious of life, and said to attain the age of 200 years. It prefers still waters, and feeds on aquatic plants, worms, etc. It is remarkable for its fecundity. Its flesh is highly esteemed as food, but it is not a

very valuable fish for the angler, because it does not bite freely.

Carpathian Balsam, an oleo-resin or essential oil distilled from the fresh cones and green tops of *Pinus umbra*, in Germany.

Carpenter, a worker in woods, who usually combines the business of a joiner. See CARPENTRY. — A ship's officer who has charge of the boats and repairs.

Carpenter's Bench, the work-table of a carpenter.

Carpenter's Rule, a two-foot folding rule for the pocket, subdivided into inches and parts, for measuring work.

Carpenter's Square, a tool for squaring woodwork.

Carpentry, the trade of a carpenter, the art of cutting, framing, and assembling pieces of timber, for house and ship building. It is distinguished from *Joinery* by the fact that the pieces of timber are put together by the use of other edge-tools than the axe, adze, saw, and chisel, whereas joinery requires the use of the plane; the distinction is, however, very artificial, as all wrought timber is planed.

Names of Timber Pieces. In some arrangements of wood-work the timbers tend to bend, in others to compress, in others to stretch. If the duty of a particular piece is to take longitudinal compression, it acts as a *strut*; if to take longitudinal extension, or stretching, as a *tie*: if a single timber is strengthened by subordinate pieces, it is a *truss*; a joint for lengthening a timber, by adding pieces at the ends, is a *scarf*; a joint for connecting timbers to form a truss, roof, centering, etc., is usually a *tenon and mortise*; joints for connecting timbers in braces, ties, etc., are *dove-tails*, *crampings*, *notchings*, *lappings*, etc. *Wall-plates* distribute the pressure of the roof on the walls of a building; *principal rafters* are timbers to support the framework of the roof; *tie-beams* and *collar-beams* are timbers to connect these rafters; *purlines* are horizontal pieces which connect the principal with the common rafters; *pole-plates* connect the common rafters with the tie-beams; *king-posts* are upright pieces from the tie-beam to the principal rafters; *queen-posts* are similar in character, but different in position; *struts* and *braces* are diagonal strengthening pieces; *puncheons*, or *studs*, are short pieces placed between two others to support them equally; *straining-beams* are placed between the queen-posts; *straining-sills* are placed upon the tie-beam at the bottom of the queen-posts; *camber-beams* are horizontal on the lower surface, but obtusely angular on the upper. The modes of fastening the various pieces together give rise to the processes of *scarfing*, *plain jointing*, *notched jointing*, *dove-tailing*, *mortising*, *rebating*, etc., which, in fact, constitute the chief features in practical carpentry.

The tools ordinarily employed in *C.* are a *ripping-saw*, a *hand-saw*, an *adze*, an *axe*, a *socket-chisel*, a *firmer-chisel*, a *ripping-chisel*, an *auger*, a *gimlet*, a *hammer*, a *mallet*, a *pair of pincers*, and, sometimes, *planes*; but the latter are not necessarily used, as they, in most cases, belong to joinery.

Carpet [Fr. *tapis*; Ger. *Teppich*; It. *tappeto*], is the name applied to a woven or felted fabric, made generally of wool, which is used for covering the floors of chambers, or for spreading on the ground. *C.*, as manufactured at the present day, range themselves under two classes; — the first and ancient class being such as are made by knitting into the warp, tuft after tuft, the materials of the pattern; and the second consisting of those in which the pattern is woven up in the loom. To the first class belong the Oriental *C.* generally, as well as such as are woven at many places throughout Europe under the name of Turkish *C.* Persia is now, as it has been from the most remote times, the recognized source of what is most truly artistic, durable, and valuable in this manuf.; and after the products of that country, those of various parts of India and Turkey are most esteemed. — *Turkey C.* are made on a vertical loom; the warp threads (linen) being unwound from an upper beam, and wound round a lower beam as the weaving goes on (Fig. 62). The weaver throws in the weft threads with a shuttle; but he introduces

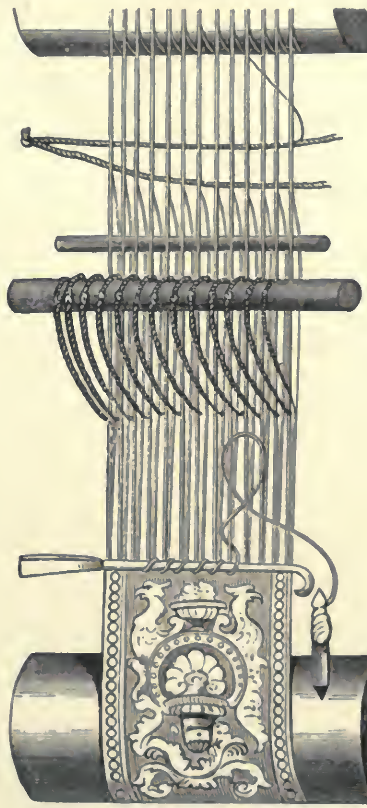


Fig. 62. — TURKISH CARPET LOOM.

with his fingers little bits of colored wool, which are twisted round the warp, and jammed up closely by the weft. Each little tuft or bunch is chosen of the proper color, according to the pattern; and therefore the selection and tying on of these bits form the generic peculiarity of the Turkey *C.* The surface is afterwards sheared, to bring the tufts to a level. — *Aubusson C.*, manufactured in the French town of that name, are generally in one piece, to suit the size of the room; they are the finest and most costly *C.* brought to the U. States. — *Axminster C.* are virtually imitations of the Turkey; they are not now much made. — *Brussels C.* have a linen web or foundation, with worsted yarns raised into loops to form a pattern. These loops are formed by means of wires, temporarily laid across the warp, the yarns being placed over the wires, and then

the loops left when the wires are removed. The colored threads to form the yarn are wound upon bobbins fixed in frames at the back of the loom. A complicated mechanism of weights, bench-wires, rails, cords, and pulleys is necessary to connect the several bobbins with the working part of the loom; and then the incorporation of linen warp, linen weft, and worsted yarns, so as to form at once a strong fabric and a colored pattern, is effected by a very intricate succession of movements. The wires are drawn out at the selvage edges of the *C.*, and the loops which they leave form the visible surface. — *Moquette* or *Wilton C.* differ from Brussels chiefly in this, — that each wire has a groove along its upper surface, which guides a knife employed to sever all the loops, and thus disengage the wire. The surface of the *C.* is thus a *pile* of cut ends, and this pile is afterwards sheared to make it a level smooth *nap.* — *Kidderminster* or *Ingrain C.* have a peculiar double structure, being, in fact, two separate *C.* linked together. The two are woven simultaneously, and at the same time are linked together. The warp is worsted, and the weft woollen.—The visible pattern is mostly formed by the weft, the warp being more buried within the substance of the fabric. The weft of the lower web is at periodical intervals brought up to the surface, and does its part towards forming the pattern. An Ingrain *C.*, from the mode of its construction, presents the same pattern on both surfaces, only with the colors reversed. They are extensively made in many parts of Scotland and the North of England, and in the U. States. — *Scotch C.* are very similar in general character to Ingrain, but many of them have three thicknesses instead of two; they consist of three webs, curiously interlacing, and called *three-ply.* — *Venetian C.* are so woven that the warp gives the pattern, the weft being wholly concealed. This is the cause of the *stripes* which these *C.* usually exhibit. By a suitable selection of weft colors the stripes may be converted into checks, tartan, and twilled patterns. — *Tapestry C.* are made of yarns *printed* before being used, in such a way that each yarn shall present different colors in different parts of its length. A pattern is thus produced with less complexity of apparatus than for the Brussels or Wilton *C.* — *Felt C.* are, in fact, nothing more than printed pieces of felt. — *Hemp C.* and *Rag C.*, which are manufactured on a large scale in the U. States, are also cheap substitutes for real *C.* The U. States are now, after England, the principal seat of the *C.* manuf. in the world; and American *C.* now rival, sometimes favorably, the British *C.*, in quality and colors. In 1871, the U. States imported from Great Britain 6,882,456 yards of *C.*, valued at $5,433,190 (which was 65 per cent of the total exports of British *C.* for that year), while in 1878 America received from foreign countries, chiefly from England and Scotland, only 278,262 yards of *C.*, valued at $398,389.

Imp. duty: — *Angola*, so called two-ply ingrain, of wool, grass, and cotton, 12 cts. per sq. yd. and 35 per cent. — *Aubusson*, *Axminster*, medaillon or whole *C.*, 50 per cent. — *Brussels*, wrought by the Jacquard machine, 44 cts. per sq. yd. and 35 per cent; *printed*, or *tapestry*, on warp, or otherwise, 28 cts. per sq. yd. and 35 per cent. — *Cotton*, 40 per cent. — *Felt*, 40 per cent. — *Flax*, 40 per cent. — *Hemp* or *Jute*, 8 cts. per sq. yd. — *Patent velvet*, *Tournay velvet*, *tapestry velvet*, printed on the warp or otherwise, value over $1.25 per yd., 40 cts. per sq. yd. and 35 per cent. — *Saxony*, *Wilton*, and *Tournay*, wrought by the Jacquard machine, value over $1.25 per yd. 70 cts. per sq. yd. and 35 per cent. — *Treble ingrain*, three-ply, worsted-chain Venetita, 17 cts. per sq. yd. and 35 per cent. — *Yarn Venetian*, two-ply, ingrain, 12 cts. per sq. yd. and 35 per cent. — *Wool*, also mixed, not otherwise provided, 40 per cent. — *Druggets*, *bockings*, printed, colored, or otherwise, 25 cts. per sq. yd. and 35 per cent. — *Hassocks*, *rugs*, *screens*, *mats*, *bedsides*, *covers*, etc., pay duty as carpetings of like description.

Carpet-Bag, a portable sack for travellers, made from carpeting, capable of holding a few essential articles or changes of linen. The name has got to be applied also to black varnished linen bags resembling leather.

Carpet-Beater, one who takes carpets to shake and beat the dust from them.

Carpet-Broom, a long-handled stiff brush for sweeping the carpets of rooms, made of strong fibre, bristle, grass, etc.

Carpet-Cleaning, the process of scouring and removing dust and stains from carpets.

Carpet-Hammer, a tool for nailing down a carpet.

Carpeting, a general name for the material for carpets; carpets in general. The name is also often applied to small lengths or floor pieces for the sides of beds in a sleeping-room. See CARPET.

Carpet-Loom, a frame for weaving carpets.

Carpet-Planner, a cutter of carpets; a workman who measures rooms, and makes a plan on paper of the breaks, door-ways, windows, etc., to ascertain the quantity of material required, and the best mode of cutting, adapting, and laying it down with the least waste.

Carpet-Shuttle, a weaver's implement.

Carpet-Strainer, a kind of metal rake or tool for holding and stretching carpets tight on the floor of a room, when laying them down.

Carpet-Weaver, a workman employed in making carpets by hand or by machinery.

Carpmeals, a kind of coarse cloth formerly made in the North of England.

Carrack, a large Spanish ship.

Carrageen, IRISH MOSS, a purplish-white, nearly transparent sea-weed (*Chondrus crispus*). It contains a large proportion of a peculiar jelly, which forms an agreeable article of food for invalids. It is used in medicine as a demulcent; also for feeding cattle, for thickening colors in calico-printing, and for sizing pulp in the paper-maker's vat.

Carrara. See MARBLE.

Carrata, a ton weight of marble at Carrara; also a solid measure of 12⅗ cubic feet.

Carraway. See CARAWAY.

Carregator, a Poruguese freighterer and charterer of a ship.

Carriage [Fr. *voiture*: Ger. *Führe*], in its widest signification, includes all structures employed for the purposes of transport of merchandise and movable goods, and of human beings. Such vehicles are generally mounted on wheels, but the sledge and the litter are types of the exception to this rule. A narrower application, however, limits the term to such vehicles as are used for the conveyance of persons, and it is in this restricted sense that the term is used here. Cars or *C.* for use on railways are also included, and will be dealt with in other connections. The forms of *C.* as now built are so numerous as almost to defy classifying, and they altogether baffle detailed description. The climate, condition of life, and various other circumstances of different countries, have originated modified forms of *C.* in each of them, some of which have come into general use, while others are seldom seen out of the land of their origin. In comparing the *C.* of the present day with those of earlier periods, it should be borne in mind that many circumstances apart from the skill and invention of the *C.* builder have combined to modify such structures, or to necessitate the modification of them. The condition of streets and roads was

such, at no very remote date, as to permit of only the most cautious traffic within limited areas in vehicles of great strength, solidity, and weight. The paving of streets and macadamization of highways gave designers of *C.* facilities for planning vehicles of a light, airy type on more elegant lines, of which opportunities they were not slow to take advantage. Again, previous to the introduction of railroads, not only public coaches but private *C.* had to be built with a view to afford accommodation for undertaking long journeys, which are now entirely performed by railroads, and that circumstance also now enables the *C.* builder to give primary attention to the comfort, gracefulness, and elegance of the vehicles he constructs. But after allowance is made for all such circumstances, there remains to coach-builders a very large share of credit for the inventive skill and ingenuity which has brought the modern *C.* to that perfection of workmanship and artistic finish which it everywhere displays. — *C. making* is a combination of crafts rarely united in one trade, embracing, as it does, work in such diverse materials as wood, iron, steel, brass, cloth, leather, ivory, hair, etc. A great division of labor and numerous highly skilled hands are consequently employed in the various stages in the construction of a high-class *C.* The workmen include body-makers, who build up the part in which persons sit; *C.* makers, who make or fit together all the under parts of the vehicle on which the body rests; wheelwrights, joiners, and fitters; trimmers, who fit up the inside of the *C.*; and several classes of smiths for special work connected with the iron framing, axles, springs, etc. Painting is an important part of the business, those professing it being divided into body, *C.*, and ornamental painters; and after the painter comes the polisher, who gives the final brilliant polish to the outside of the whole structure. A very great deal in the *C.* making business depends on the selection of materials. Ash is the kind of wood commonly used in the framework both of body and *C.*; and the quality best suited for body-wood is that of a mild and free nature, while for the *C.* the wood cannot be too strong or robust. Full-grown wood, of course, is best suited for both purposes, and the planks must be allowed to lie until they are properly seasoned, as is indeed most essential with all the wood used in the building of a *C.* After the framework is made, the lower part of the body is panelled up with the softest bay mahogany, plain and free from grain. The kinds of wood generally applied to *C.* wheel making are elm or fustic for the naves, oak for the spokes, and ash for the felloes; but beech felloes are often used, and it has been found by experience that beech, when the felloes are cut from the log shortly after it is felled, and kept until they become dry before being put upon wheels, answers admirably for this purpose. American hickory is also one of the best available woods for spokes, as well as *C.* poles; and machine-made hickory wheels are now exported from the U. States to England and other countries. American black walnut has also come into use as a substitute for mahogany in panelling, and many other woods are available for special portions of *C.* The iron mounting of coach-work requires the skill of experienced smiths; for, besides solidity, some degree of taste is requisite to form the shapes and sets of the different parts. No branch of *C.* making contributes more to the elegance of the vehicle than that of the painter. His colors must be of the best quality in order to stand exposure in all weathers. The varnish used is copal, of which there are two kinds, — the finest for finishing the body, and the second for finishing the carriage. Between paints of different qualities and varnish, a well-finished *C.* gets from 20 to 24 separate coats before it is finished. Between each coating of varnish color and varnish the work is carefully rubbed smooth and flat with pumice or fine glass paper, and the final polish is attained by rubbing with the palm of the hand. According to the U. States census of 1870, there are in this country 11,947 establishments, 56,294 hands, and a capital of $37,637,000 engaged in the *C.* and wagon manuf. In 1878 the American exports of *C.*, carts, and parts of the same, amounted to $979,003. *Imp* duty, (*C.* and parts of *C.* furniture, *C.* hardware, etc.,) 35 per cent.

Carriage-Brake, the drag or retarder applied to the wheel for stopping a carriage.

Carriage-Builder, one who designs and constructs carriages.

Carriage-Fitters, workmen who fit and suspend the bodies on the under works, and apply the various parts furnished by special manufacturers, such as lamps, handles, etc.

Carriage-Fittings, the iron or other metal parts of a vehicle.

Carriage (Hand), an invalid's wheel chair, or child's perambulator.

Carriage-Joiners, operatives who make the glass frames, blinds, boxes, trunks, etc.

Carriage-Makers, persons who make the under works, apply the parts necessary for locking or turning the carriage, fix the axles, springs, etc.

Carriage-Retarder, a brake for carriage-wheels.

Carriage-Rug, a sheep-skin mat, fur, woollen, or other wrapper or rug for the feet and legs in travelling.

Carriage-Smiths, workmen engaged on the iron-work of carriages, who are divided into body-smiths, tire-smiths, spring-smiths, etc., from the different work they are engaged upon.

Carriage-Spring, a series of metallic banded plates; steel springs to lessen the motion of a carriage, and give elasticity.

Carriage-Trimmers, men who fit up the insides of carriages, fix the silk, cloth, and laces in the necessary parts.

Carriage-Upholsterer, a tradesman who furnishes braid, lace, buttons, silk, straps, etc., for the interior fittings of carriages.

Carriage-Wheel. See WHEEL.

Carrick-Bend, a peculiar kind of knot made in a cordage.

Carrick-Bitts, the windlass-bitts in a ship.

Carrier. See COMMON CARRIER.

Carrion, the carcass of an animal; slaughtered meat unfit for human food.

Carronade, a short piece of ordnance carrying a 32 or 42 pound shot.

Carrot [Fr. *carotte*; Ger. *Möhe*; It. *carota*; Port. *cenoura*; Sp. *zanahoria*], an umbelliferous plant, *Daucus carota*, having a succulent root, which is largely used as human food, and in some places for the maintenance of stock, especially horses and dairy cows. Carrots can be kept for many months if the tops are cut off, and they are then placed in damp sand.

Carrying-Trade, the business of transporting merchandise, etc., from place to place by sea or land.

Cart, a vehicle on two or four wheels, adapted for conveying loads, light or heavy, according to the peculiar build or construction of the cart.

Cartage, Drayage, Truckage, the act of con-

veying goods in a cart, dray, or truck, from one part to any other part of a town; also, the charge for the same.

Carte, a French name for the bill of fare at an eating-house; the list of wines, etc.

Carte-blanche [Fr. white paper], paper containing nothing but the signature of the person who grants it, in order that the person to whom it has been delivered may insert such conditions as he chooses. This term is also used in a general sense to express an unlimited authority delegated by any one to another. The term is taken from the French. In France, however, the commercial and legal term is *blanc-sing*.

Carthagena. See COLOMBIA (U. STATES OF) and SPAIN.

Carthamus. See SAFFLOWER.

Cart-Ladder, a kind of rack thrown out at the head or tail of a cart, to enable it to carry a larger load of light goods.

Cart-Load, the quantity that a cart will hold, or a horse can draw. A single horse will convey a load of two tons over the paved streets of a town. A cart of grain is five quarters, or forty bushels.

Carton, Cartonnage, pasteboard for paper boxes.

Cartonné, a book bound in boards.

Cartonnerie, the French word for a pasteboard manufactory. The manufacture of stiff paper boxes is largely carried on in France. In Paris 4,000 persons are employed in it, and the trade is divided into six distinct branches, each making special kinds of boxes.

Carton-Pierre, a species of papier-maché, imitating stone or bronze sculpture. It has been used for roofing, and is composed of the pulp of paper mixed with whiting and glue. This is pressed into plaster piece-moulds, backed with paper, and, when sufficiently set, removed to a drying-room to harden.

Cartoon, a stiff paper or cardboard box, used by fancy-goods merchants and others. — A rough sketch or outline in chalk made on stout paper in order to be transferred on a fresh plastered wall to be painted in fresco.

Cartouch, a canvas or leather cartridge-box; a case for holding musket-balls and powder.

Cartridge [for guns, Fr. *gargousse;* Ger. *Kartusche;* for small arms, Fr. *cartouche;* Ger. *Patrone*], is a tube or case to contain ammunition, to be shot from some kind of fire-arm. The primary use of it is to save time in loading. *C.* for cannon are bags of gunpowder, and sometimes bullets, fastened up in a convenient way. *C.* for fowling-pieces, muskets, carbines, etc., are tubes of paper, pasteboard, or brass, each containing a definite quantity of powder, if for a *blank C.;* if for *service*, the tube also contains a bullet or else shot.

Cartridge-Case, a box with cells for holding cartridges. Also the paper in which the powder of a cartridge is enclosed.

Cartridge-Paper, a very stout paper for drawing rough designs on, or for making cartridge-cases, etc.

Cart-Saddle, the harness support on a horse's back to which is attached the breeching, chains, traces, etc. of a cart.

Cart-Wheels, large stout wheels made for carts, capable of supporting heavy loads.

Cart-Wright, an artificer who makes or repairs carts.

Carved-Work, sculpture, or open work in stone, wood, etc.

Carvel, Caravel, a small Spanish ship.

Carver, one who designs and works on sculpture, or who cuts wood and stone in the form of figures or other devices as ornaments and in enrichments of mouldings. — A long pointed knife for cutting up joints of meat and poultry.

Carving, the art of forming any hard materials into a proposed shape or figure by means of sharp instruments. It is usually understood to refer exclusively to works in ivory or wood, to distinguish it from *C.* in marble or stone, which comes under the term *sculpture;* or in metals, when it is called *chasing*. The woods preferred by modern carvers are the pear, lime, American pine, maple, oak, and box; and the tools they employ are round hollow chisels called gouges; others, with an angular extremity, called from the shape V-tools; flat chisels of various sizes, and files. A mallet is sometimes used, but pressure, or a sharp blow from the bottom or heel of the hand is generally preferred. The surface is cleaned and polished with sand-papers of different qualities, by pumice-stone, and by friction. In preparing wooden blocks for printing from, the object is engraved with instruments similar to those commonly used for engraving. This branch of the art does not therefore properly come under the term *C.* See WOOD-WORKING MACHINERY.

Carving-Fork, a large fork with a protecting guard for carving joints of meat.

Cascarilla, the bark of *Croton eleuteria*, a tree of the West Indies. It is an aromatic bitter, stomachic, and tonic.

Case, a box of any kind. — The outside of a watch. — A printer's box for the types, from which the compositor gathers them separately, and arranges them in lines and pages. They are usually in pairs; one of which is styled the *upper-case*, and is divided into 98 boxes or recesses of equal size, in which are deposited the capitals, small capitals, accented letters, etc.; the other is called the *lower-case*, and is divided into 54 boxes or recesses of unequal size, containing the small letters, figures, spaces, etc., the letters most in use having the largest boxes assigned to them. The cases are two feet nine inches long, one foot four inches and a half broad, and an inch in depth.

Cased-Goods, in the glass trade articles in which colored metal has been added to flint glass.

Case-Hardening, the process of converting the surface of iron into steel. The goods, previously polished, are heated to a bright red, and rubbed or sprinkled over with prussiate of potash. As soon as the prussiate appears to be decomposed and dissipated the articles are plunged into cold water. The process has been well conducted when the surface of the metal proves sufficiently hard to resist a file.

Casein, the curd or coagulable portion of milk.

Case-Rack, a printer's frame for placing the wooden cases of type on.

Case-Shot, pieces of iron, musket-balls, or other projectiles enclosed in a case for firing from a cannon.

Caseum, the purified curd of cheese.

Cash, the general name for coin and bank-notes, sometimes applied to checks, government bonds, and other property easily convertible into money. — The only coin of the Chinese, also called *le*, which is nominally divided into 10 *haous*. These cash are made of a very base alloy of copper, are round, measure between $\frac{5}{6}$ and $\frac{9}{10}$ of an inch in diameter, and have a square hole in the middle, by which a hundred or more are usually strung together. On one side are Chinese characters, denoting the reign under which they were cast; and on the other side are either Chinese or Mantchou characters, designating the place of coinage. The

cash is cast also in Japan, Corea, and Cochin-China.

Cash-Account, an account strictly limited to cash transactions.

Cash-Book, a book in which are registered the particulars of all cash transactions incidental to business. See BOOK-KEEPING.

Cash-Box, a metal or wooden case for keeping money in.

Cash-Credit is an undertaking on the part of a bank to advance to an individual, or to a partnership, such sums of money as may from time to time be required, not exceeding on the whole a certain definite amount; to be repaid, and a continual circulation kept up by the replacing in the bank of profits and sums as they come in. The security upon which the advances are made is usually a bond with sureties for the repayment, on demand, of the sums actually advanced, with interest upon each issue from the day on which it is made; interest at a lower rate being allowed by the banker for the sums paid into the bank. The security, in short, enables one to transact business with the bank, as if the sum for which the sureties have become responsible were actually deposited in his own name. When the banker discounts bills to the holder of the account, he may either enter them to the debit in the account, or hold them as separate transactions; but by adopting the latter step, he is not foreclosed from entering them afterwards on the account, and so making the sureties responsible. The bond thus covers every description of transaction on account of which the party may become responsible to the banker, whether it be by a single check drawn by the holder himself, or a bill discounted by him, for payment of which the banker may have looked at first to another party.

Cashew-Nut [Fr. *noix d'acajou;* Ger. *Akajunüsse;* Port. *nozes d'acaju;* Sp. *nueces d'acaju*], a kidney-shaped nut attached to the fruit of a small tree (*Anacardium occidentale*), found in the West Indies and South America. The kernel is a wholesome article of food and is used as an ingredient in puddings. It is also sometimes roasted for communicating a flavor to Madeira wine. An oil is obtained from the inner shell. The fruit is highly esteemed in Brazil.

Cashier, CASH-KEEPER, one who has charge of money; one who superintends the books, payments, and receipts of a bank or trading concern. In a joint stock banking co., the *C.* is usually a permanent officer, appointed by the board of directors, and next in rank to the president.

Cashmere, a stuff made of goats' hair; also a fancy woollen fabric.

Cashmere Shawls, the costly and beautiful shawls made from the delicate downy wool found about the roots of the hair of the Thibet goat (*Capra hircus*). They are sometimes, but incorrectly, named *Camel's-hair shawls*. These Oriental fabrics are woven by very slow processes, and are therefore very expensive, being sold in Paris and London at from $800 to $2,000 apiece. The wool is spun by women, and afterwards colored. A fine shawl, with a pattern all over it, takes nearly a year in making. To the people of Cashmere this manufacture is very important. About 16,000 looms are continually at work, each one giving employment to 3 men. The annual sale there is calculated at 30,000 shawls. It has long been the aim of European nations, on account of the beauty and value of these shawls, to imitate them, if possible, and apply to their manufacture the more speedy and elaborate methods which modern science has placed within our reach. The French have been most successful, and shawls are now produced at Paris, Lyons, and Nismes, known in commerce as French cashmere, which closely approximate in stuff and style of work to the Oriental, while much lower in price, although still costly. Norwich, Bristol, Paisley, and Edinburgh have also manufactured very good imitations of these shawls. The Cashmere wool imported for this purpose comes into Europe through Kasan, on the eastern bank of the Volga, and also directly from India and Persia. *Imp.* duty, 50 cts per lb. and 40 per cent.

Casimir, the French word for Cassimere.

Casing, the act of packing in a case. — The process of plastering a building-frame or timber work, and indenting into squares, etc., while moist, so as to resemble stone. — A name for dried cow-dung, used as fuel in some parts of Ireland and other countries.

Casino, a public place of amusement, where music and dancing are carried on.

Cask, a wooden hooped vessel, or barrel, of staves and headings, of variable shape and dimensions, for holding liquors. See BARREL, BUTT, HOGSHEAD, PIPE, TIERCE, etc.

Caskaval, a kind of cheese resembling Chester, made in Moldavia.

Casket, a small jewel-case or box for ornaments, etc.

Cask-Lifting Frame, a tilter for facilitating the drawing off liquids when the cask gets low.

Cassaba, an Arab measure of about 4 yards.

Cassareep, the inspissated juice in which the starch of the bitter cassava (*Janipha manihot*) has been washed; it forms a delicious sauce in the tropics, and is the foundation of the far-famed pepper-pot of the West Indies.

Cassava, a poisonous shrub (*Janipha manihot*), cultivated in the West Indies and South America for the sake of the starchy matter contained in its roots. The name "bitter *C.*" is commonly given to it in the West Indies, to distinguish it from another species of the same genus, which, from having no poisonous properties, is named the "sweet *C.*" The roots of both species yield the starch, but those of the poisonous plant are the richer. The roots, after being well washed and scraped, are rasped or grated, and the pulp thus formed is subjected to strong pressure, to expel the poisonous juice which it contains. The compressed pulp is next thoroughly dried over the fire, being constantly stirred the whole time, by which any remaining portion of the noxious juice is either volatilized or decomposed. It now forms *C. meal.* When it is further prepared by grinding, it forms *fine C. meal* or *C. flour.* When the compressed pulp is baked on a hot plate, it forms *C. bread* or *C. cakes*, the flavor of which greatly resembles that of Scotch oat-cakes. See TAPIOCA.

Casse, the French name for Cassia bark; also for breakage.

Casse-Paper, broken or damaged paper.

Casserole, the French name for stew-pan.

Cassia-Bark. A large number of trees of the Cinnamomum family are stated to furnish the *C.*-bark of commerce in the East, although it is usually ascribed to *Cinnamomum Cassia. C*-bark is easily distinguished from cinnamon by its very mucilaginous character when chewed. It appears, however, probable that *C.*-bark is merely an inferior kind of cinnamon, obtained from the larger branches and trunk of the true tree in Ceylon and other islands of the East. *C.*-bark is used as a

purgative. *Imp.* duty, 10 cts per lb.; ground, 20 cts. per lb.

Cassia-Buds, the immature flowers (perianth and ovary), gathered and dried, of several species of cinnamon, chiefly used in confectionery, having the flavor and pungency of cassia. *Imp.* duty, 20 cts. per lb.

Cassia-Fistula, the commercial and botanical name for the legumes or cylindrical pods of the pudding-pipe tree; the cells are filled with a sweetish pulp, which is an agreeable laxative and the base for purgative electuaries.

Cassia-Oil, a volatile oil, obtained from cassia-bark. It is of a fainter color than cinnamon oil; taste acrid and pungent, and odor agreeable.

Cassimere, or KERSEYMERE, a thin, fine woollen cloth, chiefly used for vests and waistcoats.

Cassinets, a light mixed cloth, the warp of cotton and the weft of very fine wool, or wool and silk, made for summer wear.

Cassis, the black currant (*Ribes nigrum*), formerly celebrated for its medical properties, but now only used in preparing the French liqueur of that name.

Cassius-Purple, a beautiful pigment used for staining glass and painting porcelain; a mixture of oxide of tin and gold.

Cassock, a clergyman's black gown or vestment.

Cassolette, a small box in glass, ivory, or precious metals, containing perfumes, with a capillary hole to allow the odor to escape.

Cassonade, the French name for coarse brown moist or muscovado sugar.

Cassumanur, or CASSUMUR, an aromatic root, the yellow zedoary (*Zingiber cassumanur*), of the East Indies, somewhat resembling ginger, but the rhizoma much larger, of a pungent bitter taste.

Cast, a mould or copy taken from a pattern.

Castanets, a pair of small concave shells, of ivory, bone, or hard wood, held on the thumbs and rattled by the fingers to make music, or to mark time for dancers and others.

Castellano, a weight for gold used in South America, of about 71 grains. The mark of gold is equal to 50 castellanos, or 3,550 grains.

Caster, a founder; one who makes castings in metals.

Casters, a bottle-frame or stand for holding cruets.

Castile Soap, a hard, mottled, curd soap, made with olive-oil and soda.

Casting, the process of giving to steel a better quality, by pouring it into moulds or ingots while in a liquid state. — A foundry operation; the process of running metal into a shape; the taking impressions from medals, figures, etc. — The metal so shaped.

Casting and Founding. There is no real difference in the meaning of these two terms, except that *casting* sometimes means pouring a cold liquid (such as liquid plaster of Paris) into a mould, whereas *founding* always implies the use of a molten metal. The mould for large metal castings is mostly formed in some kind of sand or loam, but occasionally in iron. For some articles, such as plates and slabs, molten metal is poured out upon a smooth horizontal bed of sand; for others, into an upright moulded cavity open at the top; for others, again, into a mould enclosed on all sides except an aperture or two to receive the flow. Very often a sand mould is made by pressing a wooden pattern upon or into the sand, thereby producing cavities which are afterwards to receive the molten metal. Some moulds contained in iron boxes are hinged together in two parts, to facilitate opening and closing. For casting small articles in brass, iron casting-boxes, called *flasks*, are employed; the sand contained in these receives its mould form from a pattern; and the same flask will then serve for an indefinite number of different patterns in brass. In large iron casting (of which examples are given under CANNON FOUNDING, CYLINDER CASTING), the metal is melted in a furnace constructed for this particular kind of work. (See CUPOLA FURNACE.) When the metal is melted, it flows out of the opened tapping-hole either into channels in the casting-floor, or into ladles, which are of such varied sizes as to contain from 50 lbs. to 6 tons each, — the latter, of course, worked by powerful machine cranes. From the ladles the metal is poured into moulds. Most articles are cast horizontally, — that is, with the length and breadth horizontal; but such articles as cylinders, cannon, pipes, shafts, etc., are cast vertically, and mostly in pits. Most castings, when removed from the moulds and cleansed from the adhering sand, etc., require the seams and rough edges to be smoothed down by chisels and files.

Casting-Net, a net to be thrown in the water from a boat, and drawn instead of left.

Casting-Pot, a pot adapted for melting metals.

Cast-Iron, iron run from the furnace into pigs or ingots, instead of being beaten or wrought.

Castor [Fr.], a heavy milled cloth for overcoats.

Castor-Beans, a name sometimes given to the seeds of the castor-oil plant. See CASTOR OIL.

Castoreum, or CASTOR [Fr. *castoreum;* Ger. *Bibergeil;* Rus. *boboowaja struya*], a concrete medicinal substance of a peculiar nature, found in two pear-shaped bags situated beside two smaller follicles, in the inguinal region of both sexes of the beaver. It is of a penetrating, unpleasant odor, and a bitterish and somewhat acrid taste. The Russian *C.*, which is the most esteemed, occurs in pairs of bags of unequal size, from 3 to 4 inches long, and 1½ to 2 inches broad at the base; it is now very rare. The bags of American *C.* are smaller, narrower at the base, and much corrugated. That which is very old, quite black, and almost destitute of taste and smell, should be avoided. It should be kept in a cool place, and in a well-corked bottle. *Imp.* free.

Castor Hats are hats made from beaver fur.

Castor Oil [Fr. *huile de ricin;* Ger. *Rizinusöhl;* It. *olio di ricino;* Port. *oleo de mamona, de ricino;* Sp. *aceite de palma cristi*], is prepared from the seeds of the *Ricinus communis*, or *Palma Christi*, a plant which grows in the East and West Indies, America, and the S. of Europe. The oil is obtained from the seeds either by expression, without any assistance from heat, or by boiling. The first, called *cold-drawn C.* oil, is always to be preferred. It is of an amber color, and of a slightly nauseous smell and taste. The oil obtained by boiling the seeds is more deeply colored, more acrid, and more liable to become rancid. The nut or capsule is trilocular, nearly the size of a large marble, of a pale green color, and usually contains three whitish seeds of an oblong flat shape, and heavy taste. The plant is extensively cultivated in the Southwestern States, and most of the seeds are sent to St. Louis, where they are expressed into oil. *C.* oil is also largely produced at Jersey City from seeds mostly imported from India. *C.* oil is much used in medicine as a mild and certain purgative. It is the only fatty oil which combines readily with alcohol, and is therefore also much used in the preparation of hair-oil. *Imp.* duty, beans or seeds, per bushel of 50 lbs., 60 cts. per bushel; oil, expressed, $1 per gallon.

Castor Pomace, the cake of the castor seeds after the oil is expressed. It is used as a manure.

Castors, small roller-wheels fixed to the feet of heavy household furniture, such as beds, tables, arm-chairs, etc., to admit of moving them with facility. There are plate *C.*, square and round, socket *C.*, claw *C.*, etc. — Cruets or bottles for holding sauces.

Castrating-Clamp, a contrivance used in confining the cords and vessels of the horse, or other animal, in the operation of orchotomy by excision of the parts.

Cast Steel is blister steel which has been broken up, fused in a crucible, poured into moulds, and rolled.

Cat, a wild and domestic animal, *Felix catus*, whose skin is largely used for furrier's purposes. — A kind of tackle used to hoist the anchor to the fore part of a ship.

Catalogue, a written or printed list of books or articles. *C. raisonné* is a classed or arranged *C.*, in which the articles are placed under regular heads or divisions.

Catamaran, a rude surf-boat or shaped log for a single individual, used to reach the shore at Madras in the East Indies. The Madras surf-boats consist of thin flattened timbers 8 or 10 feet long, tied together horizontally, and sharpened a little at the point. Also a light raft used on the coast of Brazil for landing goods through the surf.

Cataract, a lock-gate. —A contrivance to regulate the number of strokes per minute of an engine.

Catawba Wine. See WINE.

Cat-Block, a large block with three or four sheaves, used in hoisting up an anchor to the ship's side.

Catch-Penny, anything worthless or of little value, made merely to sell.

Catchups are sauces made from mushrooms, tomatoes, walnuts, etc.

Catechu, Cashew, Cutch, Gambir, Terra Japonica [Fr. *cachou;* Ger. *Katchu:* It. *catecu;* Port. *ocas escaladas;* Sp. *cabial*], an astringent extract, chiefly prepared from a decoction of the brown heart-wood of the *Acacia catechu*, a tree indigenous to Hindostan. It is a dry, opaque, friable substance, of various forms, rounded masses, or cut into disks, squares, or lozenges. Its taste is powerfully astringent, afterwards bitterish, then sweet, and its color varies from pale brown to chocolate brown, the darker colored being the most astringent. It is soluble in water, but more easily in alcohol. It seems to keep for any length of time without change. *C.* contains a greater proportion of tannin than any other substance known, 1 lb. being in this respect equal to about 7 or 8 lbs. of oak bark; dissolved in water, it tans skins very rapidly, but the leather is not so durable or good as that which is more slowly prepared from oak bark. Two sorts are chiefly imported, namely, an inferior kind from Bengal, and another of a yellowish-brown color from Bombay. There is but little difference betwixt the two varieties; but according to the analysis of Davy the Bombay *C.* affords the greater proportion of tannin, and is therefore preferable. It is consumed in enormous quantities as a masticatory by the Malays and other betel-eating nations. In this country it is used in medicine as an astringent, occasionally for tanning, and in dyeing. With it the dyer produces, inexpensively, many of his most pleasing browns. Alum mordants are mostly employed in dyeing with *C.* The salts of copper with sal-ammoniac cause it to give a *bronze color*, which is very fast; the protochloride of tin, a *brownish yellow;* the perchloride of tin, with the addition of nitrate of copper, a *deep-bronze hue;* acetate of alumina, alone, a *reddish brown*, and with nitrate of copper, a *reddish-olive gray;* nitrate of iron, a *dark-brown gray*. For dyeing a *golden coffee-brown*, it has entirely superseded madder, 1 lb. of it being equivalent to 6 lbs. of that root. *Imp.* free.

Caterer, one who has to purchase, provide, or purvey for others; the manager of a mess.

Cathetometer is an instrument used to measure the vertical distance of two given points: for instance, the difference in height of two liquid columns. It consists substantially (Fig. 63) of a vertical road along which slides a horizontal telescope, which, by its run between two points, ascertains their vertical distance.

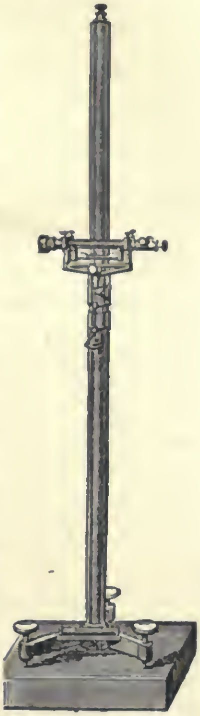


Fig. 63. — CATHETOMETER.

Cat-Fall, a pulley for hoisting the anchor of a ship to the cat-head.

Catgut, or CATLING [Fr. *corde à boyau;* Ger. *Darmsaite;* It. *corde di budella*], cord made of the twisted intestines of the sheep. There are different kinds, as whip-cord, hatters' cords, cords for bow-strings, clock-makers' cord, and fiddle and harp strings; these last, made of the peritoneal covering of the intestines, are chiefly imported from Naples, where they are manufactured of a quality superior to those prepared in any other country. *Imp.* duty, on whips, unmanuf., free; for musical instruments, free; on whip-gut strings for other purposes, 30 per cent.

Cathartic Medicines, those which have purgative properties.

Catharine-Wheel, a pyrotechnic which revolves and throws out radiations as it turns.

Cat-Head, a mariner's name for a small capstan. — A projecting timber or beam on each side of a ship's bow, to which the pulley is attached, to assist in heaving up the anchor, and securing it to the side.

Cathedral Glass, stained or painted glass for church windows, sold either in sheets or small squares.

Catheter, a surgical instrument for relieving obstructions in the bladder, made of various materials.

Catjang, the Malabar name for *Cajanus flavus*, a leguminous plant, the seed of which is much eaten by the poorer classes, and esteemed a wholesome pulse.

Catling. See CATGUT.

Cat-Mint, the *Nepata cataria*, which has some stimulating qualities, and is a remarkable feline aphrodisiac.

Cato, a name for baskets in some of the Pacific islands, which are very neatly and elegantly made from coir and other palm fibres, and grasses.

Cat-o'-Nine-Tails, a whip for corporal punishment, with nine lashes.

Catopter, Catoptron, a mirror, a reflecting optical glass.

Cat-Ropes, the pulleys employed in hoisting a ship's anchor over the bows by the cat-heads.

Cat-Salt, a granulated coarse salt formed from the bittern or leach brine used in the manufacture of hard soap.

Cat-Skins, the skins of the wild or domestic cat, bought by furriers and others. Wild cats with a long and valuable fur abound in the forests of Hungary, and in Holland the domestic cat is bred for its fur, being fed on fish, and carefully tended until it arrives at perfection. The cat's skin makes an excellent rubber for electrical machinery, and is also used for sleigh coverings, railroad rugs, etc.

Cat's-Eye, a gem which presents a beautiful opalescence like the light of the eye of a cat. It is a variety of fibrous quartz, interspersed with filaments of asbestos. It is often brown and red, but commonly of a grayish or greenish color, and generally translucent. This stone, which is chiefly found in Ceylon and Malabar, is held in high estimation.

Cat's-Paw, a kind of hitch made by sailors in a rope.

Catsup, Ketchup. Same as CATCHUP, q. v.

Cattemundoo, or CALLEMUNDOO, an elastic gum, or hydro-carbon, obtained in India from the *Euphorbia antiquorum*, and other species.

Cattle (Neat). The domestic ox, *Bos taurus*, said to be of Asiatic origin, is found from the equator almost to the limits of vegetable life. According to the estimates of the statistician of the American Department of Agriculture there were, in round nnmbers, 28,000,000 neat *C.* in the U. States in 1876, valued at $680,000,000. In this estimate the average price of milch cows is placed at $28.29, and that of "oxen and other *C.*" at $19.04 The low grade of the *C.* of Texas and several other of the Southern States in part accounts for these low general averages for the country at large. Other authorities, while agreeing with the Department as to the number of *C.*, raise the total valuation to $1,000,000,000. But either of these totals is sufficient to call attention to the magnitude of the *C.* interest in the U. States. If to either of these great amounts, representing simply an invested capital in horned *C.*, the value of their annual produce in beef, milk, butter, cheese, hides, tallow, and hair be added, that interest will be found colossal in importance. If it be true that the improvement of the common herds of the country by means of judicious crossing with animals of superior races will add from one fourth to one half to the value of the progeny and their produce, then it is not difficult to ascertain to what extent the wealth of the country might be increased through the general adoption of such a course. Of course there are no means of ascertaining with any degree of accuracy to what extent the "grading" or crossing of common stock with thoroughbreds of the various imported races has been carried It is safe to say, however, that out of the 28,000,000 neat *C.* in the country the percentage of improved animals is quite inconsiderable, and these confined, for the most part, to those of the Eastern dairying States, where improvement has been made on the common cow, and in several of the Western States where increased beef-production has been the object sought to be obtained. It is evident, therefore, in view of the comparatively small number of thorough-bred animals to breed from, and of the unaccustomed habits of our people in the practices of breeding and their undefined notions as to the importance of new infusions, that the task of raising the standard of American *C.* must be one of gradual accomplishment. Fortunately for the American farmer he is not compelled to experiment with his *C.* through many generations in order to develop and establish desirable qualities. He may find, within comparatively easy avail for the purpose of improving his own stock, races so thoroughly fashioned by the hands of successive breeders as to be almost worthy the name of creations on account of type-superiority. We are indebted to the persevering labor and unremitted experiment of English and Scotch graziers for the most valuable races which now contend for favor in this country. The power of transmission of cultivated qualities is one of the marked possessions of these animals, and upon this fact is predicated the possibility of carrying up the standard and the consequent profitableness of our *C.* The breeds introduced into this country for their superior milking qualities are the Ayrshire, from Scotland, the Jersey, from the Channel Islands, and the Holstein, from Holland. The *Ayrshire* is hardy of constitution; it puts on flesh well when carefully fed, and when the cow is crossed with the short-horn bull the excellent qualities of both as to beef and milk are evenly developed in the offspring. It was introduced into the U. States about the year 1820, and its purity maintained in a comparatively large number of select herds, as is shown by the *Ayrshire herd-books.* The *Jersey C.*, originally a native of Normandy, is the most generally known in America, and has the reputation of affording an unusually rich quality of milk, rather than a great quantity. In this country, the *Jersey Cattle Club* exercise the strictest surveillance of importations in order to preserve the integrity of blood of the herds on this soil. There is a decided smack of aristocracy in the American-bred Jersey animals. In England the cow is the pet of the nobleman's park; in America, the favorite of the family living in vicinities where the range of pasturage is small, inasmuch as it thrives well in the stall or small enclosure. For richness of cream and of butter to yield of milk the Jersey cow is not surpassed. Its butter is a luxury, commanding in the large cities from 60 cents to $1.15 per pound. The Jersey is smaller in size than our common *C.*, somewhat angular in appearance and tender in frame, and is usually of a very deep-red color. The *Holstein* is the most recent of the milking breeds imported for trial, having been introduced by Mr. Chenery, of Boston, in about 1860. It is remarkable rather for the quantity than for the richness of its milk; but it affords the advantages of being a good feeder and of laying on flesh in good proportion, thus enhancing the value of steer production. In size it is large and bulky, less elegant in frame than the Short-horn, and in color is a mixture of black and white. The imported breeds more especially valued on account of beef-producing qualities are the Hereford, the Devon, and the Short-horn. The first *Herefords* were brought to Kentucky by Henry Clay, who was a great admirer and patron of fine stock, in 1816. But, notwithstanding their well-defined excellences and great superiority over the cattle common to this country, for some reason not wholly explained this breed has not been as widely distributed nor attracted the public attention that its undoubted merits deserve. The race is highly prized in England, where, in some grazing districts, it is held in equal esteem with the Short-horn, which it nearly equals in size and weight. It is generally red in color, with white face, and frequently with white along the back and underneath the body. The first importation of *Devons* from England was made in 1817 into Maryland. As in the case of the Herefords, they have not occupied as great a place in the public mind as their merits would fully warrant. But there are nevertheless a number of fine herds in

the country, the purity of which has been maintained. It is red in color; in size medium. It has a hardy constitution, possesses milking traits in good degree, and is easy of improvement through cultivation for that object. The race now distinctively known as *Short-horns* (Fig. 64) was first imported into America in 1785. They now very largely outnumber all other improved breeds in the U. States, the *Herd's-Book* showing a record of more than 60,000 well-bred animals. The admirers of this breed consider the animals as well-nigh perfection in symmetry. The handsome head is firmly set on a strong and muscular neck; there is great width and depth of chest, the shoulders shapely and well formed. The fact that the race of Short-horns has attracted here, as in England, more particular and general attention than any other, is due, as far as the general public is concerned, more to the speculative interest that has been maintained for some years, carrying the prices of particular families and "fancy strains" to fabulous figures, than to an ultimate understanding of the actual merits of the breed. When a cow is sold for $40,000, it is not surprising that the possession of extraordinary race-merits is attributed to the animal; but in what they particularly consist is not plain to ordinary ken.

There has been too much importance attached to the mere pedigree, and too little consideration of the intrinsic merits of the animal; too great desire to own an animal rather on account of the particular family it represents than for its capabilities in the direction of profit at the pail or at the butcher's block. "Fashionable" strains and fabulous prices have been the causes of incalculable mischief in the way of a wider breeding of a better class of farm animals, as, undoubtedly, the collapse in prices in 1875 and 1876, carrying with it the fortunes of many "fancy" breeders, fully proves. A just and enlightened view of this aspect of the subject was taken by the Iowa Breeders' Association, which met at Marshalltown in Dec., 1877. In this convention were gentlemen of note in the political and agricultural annals of the State, and breeders of established reputation. As opposed to the practice of buying and selling thoroughbreds as a mere speculation, it was unanimously declared by the convention "that no member has had in his possession *for five consecutive years* a breeding Short-horn that has not proved a profitable investment of the capital employed" It was also declared that the objects ever to be borne in mind by breeders are the *improvement of the common stock of the country, and, where possible, of the pure stock itself;* and that the present depression in prices is the natural result of losing sight of the great objects of the business, as above stated, and is of precisely the same character as the uniform results of undue excitement and speculation in every business or employment. Further, the convention unhesitatingly condemned, as destructive of the utility of the animals and the interests and profits of purchasers and breeders generally, the practice of the feeding to excess of breeding animals, too often indulged in under the stimulus of competitive sales or the mistaken demands of the show-ring. Nothing is truer than this, that practical farmers and breeders will not long follow the "traders" or speculative dealers in their race after mere fashion, and that there is a growing conviction that animals will be estimated according to individual worth in promoting certain ends, — their intrinsic value consisting in the greater capacity of one animal over another to produce the larger amount of beef, milk, or butter of superior quality, at less expense for feeding, and with the smaller amount of care. If the production of beef or of milk be the especial object, it is within the power of the ordinary farmer to so improve his *C.* that, for all practical purposes, he is about as well off as though his herds claimed full descent from the best names in the Herd's-Book. The butcher is not a dealer in descent or families; nor will the cheese or butter monger ask if the products offered him are from Ayrshire, Devon, or Short-horn, provided they suit his market. The grazier wants *C.* that will feed and fatten well, and his practical eye will settle the value of the animal without reference to its pedigree; nor is he liable to ask troublesome questions about "Buzzard," or Galloway, or '17 blood that may have been filtering through generation after generation. The case of Mr. Saume, of Kellogg, Iowa, as communicated to a Western journal, is here in point. That gentleman in the month of Feb., 1877, sold at the Union Stock-Yards, Chicago, 64 head of *C.* All of these were two years old, and had been stall fed. A portion were natives or common stock, and the remainder half-blood Short-horns. The former averaged 1,236 lbs. in weight, and were, therefore, at that age heavier than average natives. These sold for $4.65 per cwt., making an average of $57.40 per head. The half-blood Short-horns, on the other hand, weighed 1,666 lbs., and sold for $6.50 per cwt., or an average of $108.29 per head. This was a difference in favor of the grades of $50.82 per head; and the remark accompanies the statement, that at the Union Stock-Yards, where *C.* are sold on their merits, the grades command from one to three cents per pound more than the best natives. This, for the reason that the offal of the improved

Fig. 64. — Type of Short-Horn.

stock is smaller in proportion to gross weight, and the carcass proportionately heavier in those parts which are most valuable, having less bone, shank, and unsalable gristle, with more loin, steak, and juicy roast. The development and steady increase of the export trade of the U. States in meats is shown in a special article (see BEEF). The corresponding increase in the exports of live *C.* is not less remarkable. A comparison of our horned cattle exports — mostly to England — for 4 years, as appears from the annual report of the U. States Bureau of Statistics, is as follows: Total in 1871, \$403,491; 1875, \$1,103,085; 1877, \$1,593,080; 1878, \$3,896,818. It has been wisely suggested that England will not look to America for beef for her laboring classes, who must perforce live cheaply, but will demand beef of a superior quality for the large class in that country who are able to pay for it. Poor beef could find no market in that land of beef-eaters. Nor is it plain that it would pay American dealers to ship a poor animal or a poor carcass. If there is a difference of from one fourth to one half as between common and well-bred *C.* in our home markets, which difference in most cases settles the question of either profit or actual loss for raising the animal, then certainly the superadded expense of shipment across the ocean would not favor the experiment of raising poor cattle for a foreign market. In establishing the export trade it has been asserted that the enterprising gentlemen who have been its promoters have exercised sound discretion in shipping carcasses of excellent quality. It is this fact, indeed, that makes the trade possible, and gives to American beef a reputation of equality with the home product, or even superiority to a large class of it, opening for our product a large and constantly increasing market. It is quite certain that the wild herds of Texas cannot supply the demand for this export trade. If it should grow to much larger proportion, it is evident that the grazing regions of the West must meet it. But as a condition precedent the standard of the common stock must be raised, and systems of feeding be adapted to secure the best quality of cattle at the least outlay. An additional incentive to the improvement of our herds exists in the fact that our own people, as they become more accustomed to what is excellent and desirable as a beef product, will be larger consumers of it, to the ultimate exclusion of that which is inferior.

There is growing activity in the live-stock interest at the West. In Iowa, 81 counties report to the Secretary of the State Agricultural Society the possession of herds, large and small, of improved breeds, mostly Short-horns; and West Liberty is becoming noted for its breeding-farms and live-stock sales. Within a radius of a few miles from that place there are more than 600 head of thorough-bred Short-horns, held at an average of \$300. In Illinois, it is stated by Hon. W. C. Flagg, in the Report of the State Agricultural Society for 1876, that the number of thorough-bred cattle is very large, nine tenths of them being Short-horns, and the remainder Jerseys, Devons, Herefords, and Ayrshires, and that a considerable proportion of the common cattle of the country in many parts of the State have now an infusion of the blood of the various thorough-breds. The stock interest of the West has, in the National Live Stock Journal, published in Chicago, a very efficient and conscientious exponent and advocate. In the work of disseminating reliable and well-considered information on its specialty, it is ably seconded by journals of character in several of the Western States. The impulse given by these journals and the agricultural press generally, in connection with the various State breeders' associations, composed usually of substantial farmers, is apparent in the annually increasing attention given to the introduction of the better class of animals upon the farm.

No accurate information can be obtained regarding the internal commerce of the U. States in *C.*, from its scarcely coming within the range of public accounts. *C.* are largely imported from the Canadian Dominion, chiefly for shipment to Europe, but the exact number and value of our importation of *C.* is unknown, the tables of exports published by the U. States government including *C.* under the general heading of *Living animals.* In 1878 the total value of imports of living animals was \$2,664,676. *Imp.* duty, 20 per cent.

The parts of an ox to which the term *offal* is usually applied are the head and feet, the tallow, the hide and horns, and the entrails. The tallow is generally considered to be of the same value, weight for weight, as the flesh of the four quarters; and so likewise is the hide. These and the other parts termed offal are commonly regarded as forming about one fifth of the value of the animal. When beef is said to be sold at a certain price, *sinking the offals*, the meaning merely is, that the whole price of the animal is reckoned upon the carcass alone; hence, when beef is sold at a certain price, sinking the offals, that price is more than if it were sold without including in it the price of the offals. That portion of the ox which is used for food, exclusive of the offals, is usually termed the quarters, because the animal, on being cut up, is divided into four parts or quarters. The most esteemed parts for food are the hind quarters. These weigh somewhat less than the fore quarters; though the more perfect the form of the animal is, the more nearly do the fore and hind quarters approach in weight. Practice enables persons to judge of the weight of animals by the eye alone; but it is convenient to be able to ascertain the weight by measurement. This may be done with considerable correctness in the following manner. When the animal is standing in a natural position, measure his length in feet from the foremost upper corner of the shoulder-blade, in a straight line, to the hindmost point of the rump; then measure the girth or circumfereuce immediately behind the fore-legs; multiply the square of the girth by the length, and this product by .238, which will give the weight of the quarters in stones of 14 lbs each Another method of ascertaining the weight of fat cattle is by weighing them when alive, and multiplying the gross weight by .605. The present average dead-weight of bullocks is estimated at 656 lbs., and of calves, at 144 lbs.

Cattle-Hair, the short hair of cattle, used as an ingredient in mortar. Considerable quantities are imported, chiefly from Buenos Ayres. *Imp.* free.

Cattle-Market, the place, yard, or city, where cattle are bought and sold on stated days. Chicago is the greatest cattle-market in the U. States, and perhaps the greatest in the world.

Cattle Medicines, strong drastic medicines, used by veterinary surgeons, and owners of live stock.

Cattle-Pen, an enclosure for folding cattle for the night.

Cattle-Show, an assemblage of domestic animals, held periodically, to compete for superior breeds and conditions.

Cattle-Truck, an open or partially closed car for conveying live stock on a railroad.

Catty, or **Kin**, an Eastern weight, the hundredth part of the picul, and equal to 1⅓ lb. avoirdupois; 84 catties being about 1 cwt. The Chinese catty weighs 22½ Spanish dollars; the Malayan catty 24 dollars, or rather more than 2 lbs. The catty of silk in the East is equal to about 2⅔ lbs.

Cauf, a perforated chest to keep fish in under water.

Cauk, a mining name for sulphate of barytes. — A weight in Sumatra, the fifth part of the bamboo, which is 3 lbs. 10 oz.

Caul, a net for the hair worn by ladies. — A

cabinet-maker's term for a piece of solid wood, shaped and smoothed to fasten veneers on.

Cauliflower, a well-known esculent vegetable, consisting of the fleshy, young, undeveloped inflorescence of *Brassica oleracea botrytis*, a variety of the common cabbage. It is a light, easily digested, and nutritious aliment.

Caulking, Cocking, the process of filling the seams between the planks of a ship's deck or sides with oakum, and which is afterwards covered with pitch to keep out water.

Caulking-Iron, a kind of cold-chisel used by the ship-caulker.

Caulking-Mallet, a mallet used by the ship-caulker for driving in the iron to force the oakum between the seams.

Causalty, a mining name for light particles of ore carried away in the process of washing.

Caustic, a substance that corrodes or destroys the texture of organized bodies. This action is popularly termed "burning." The principal caustics are nitrate of silver, caustic potassa, sulphate of copper, red oxide of mercury, verdigris, chloride of zinc, chloride of antimony, nitric acid, acetic acid, and carbolic acid.

Cautery, a farrier's searing-iron.

Cauthee, a coarse Indian cotton cloth.

Cautioner, in Scotland one who becomes bond or security for another.

Cautionnement, in France a sum lodged by way of guaranty or security, — as by a newspaper proprietor to the government as a surety, — to be forfeited in case of misconduct.

Cava, a name for an intoxicating beverage made in the Pacific islands by first chewing the root of the *Macropiper methysticum*, and letting it ferment.

Cavan, or **Caban**, a dry measure used in the Philippine Islands for grain; a *C.* of paddy, or rice in the husk, will weigh about 96 lbs.; of cleaned rice, 130 to 135 lbs.

Cave, a name for the space under the fire of a furnace.

Cavear, or **Caveer**, a nominal division of the Spanish dollar, 40 caveers being reckoned equal to one dollar.

Caveat [Lat., from *caveo*, to take care]. Any citizen of the U. States who makes any new invention or discovery, and desires further time to mature the same, may, on payment of the fees required by law ($10), file in the Patent-Office a *caveat* setting forth the design thereof, and its distinguishing characteristics, and praying protection of his right until he shall have matured his invention. Such *C.* shall be filed in the confidential archives of the office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof; and if application is made within the year by any other person for a patent with which such *C.* would in any manner interfere, the Commissioner shall deposit the description, specification, drawings, and model of such application in like manner in the confidential archives of the office, and give notice thereof, by mail, to the person by whom the *C.* was filed. If such person desires to avail himself of his *C.*, he shall file his description, specifications, drawings, and model within three months from the time of placing the notice in the post-office in Washington, with the usual time required for transmitting it to the caveator added thereto; which time shall be indorsed on the notice. An alien shall have the privilege herein granted, if he has resided in the U. States one year next preceding the filing of his *C.*, and has made oath of his intention to become a citizen. (*U. S. Revised Statutes, Aug.* 15, 1876, sect. 4902.)

U. S. Patent-Office Rules, Feb. 1878: — (93.) The caveator will not be entitled to notice of any application pending at the time of filing his *C.*, nor of any application filed after the expiration of one year from the date of filing the *C.*; but he may renew his *C.* at the end of one year by paying a second *C.* fee of $10, which will continue it in force for one year longer, and so on from year to year as long as he may desire. If a *C.* is not renewed at the end of the year for which it was filed, it will still be preserved in the secret archives of the office. — (94.) No *C.* can be filed in the secret archives of the office unless accompanied by an oath of the caveator that he is a citizen of the U. States, or, if he is an alien, that he has resided for one year last past within the U. States, and has made oath of his intention to become a citizen thereof; nor unless the applicant also states, under oath, that he believes himself the original and first inventor of the art, machine, or improvement set forth in his *C.* — (95.) A *C.* need not contain as particular a description of the invention as is requisite in a specification; but still it must set forth the design of the invention and the distinguishing characteristics thereof, and the description should be sufficiently precise to enable the Office to judge whether there is a probable interference when a subsequent application is filed. A *C.*, equally with an application, must be limited to a single invention or improvement. — (96.) *C.* papers cannot be withdrawn from the Office, nor undergo alteration after they have once been filed; but copies of the papers may be obtained at the usual rates. Amendments which are necessary to secure a compliance with the above conditions may be received when required. The examination will only go to this extent. — (97.) When practicable, the *C.* must be accompanied by full and accurate drawings, separate from the specifications, well executed on tracing muslin or paper that may be folded, and of the same size as demanded in drawings for patents.

FORM OF CAVEAT.

The petition of A. B., of ———, in the County of ———, and State of ———, respectfully represents:

That he has made certain improvements in velocipedes, and that he is now engaged in making experiments for the purpose of perfecting the same, preparatory to applying for letters-patent therefor. He therefore prays that the subjoined description of his invention may be filed as a caveat in the confidential archives of the Patent-Office.

A. B.

Specification.

The following is a description of my newly-invented velocipede, which is as full, clear, and exact as I am able at this time to give, reference being had to the drawing hereto annexed.

This invention relates to that class of velocipedes in which there are two wheels connected by a beam forming a saddle for the rider, the feet being applied to cranks that revolve the front wheel.

The object of my invention is to render it unnecessary to turn the front wheel so much as heretofore, and at the same time to facilitate the turning of sharp curves. This I accomplish by fitting the front and the hind wheels on vertical pivots, and connecting them by means of a diagonal bar, as shown in the drawing, so that the turning of the front wheel also turns the back wheel, with a position at an angle with the beams, thereby enabling it easily to turn a curve.

In the drawing, A is the front wheel, B the hind wheel, and C the standards, extending from the axle of the front wheel to the vertical pivot *a*, in the beam *b*, and D is the cross-bar upon the end of *a*, by which the steering is done. The hind wheel B is also fitted with jaws, *c*, and a vertical pivot, *d*.

A. B.

Witnesses:
C. D.
E. F.

[The form of oath will be substantially that provided for original applications, except that, as a *C.* can only be filed by a citizen, or an alien who has resided for one year last past in the U. States, and made oath of his intention to become a citizen, the oath should be modified accordingly.]

Caveat Emptor, a commercial law-term, expressing that a purchase is made without warranty, or at the buyer's own risk.

Cavendish, a kind of chewing tobacco pressed into cakes of square, oblong form, and sweetened with molasses or syrup.

Cavezon, or CAVESSON, a severe nose-band of various materials to punish or subdue an intractable horse.

Caviar [Fr. *caviar;* Ger. *Kaviar;* It. *caviario;* Rus. *ikra*], a substance prepared in Russia from

the roe of the sturgeon and other large fish. The roe is first freed of its membranes, and washed in vinegar or white wine. It is afterwards dried in the air, salted, and, the liquor being removed by compression in a bag, it is finally packed in kegs. When good, it is dry and of a brown color, and is generally eaten with oil and lemon-juice. *C.* is highly esteemed in Russia, and the consumption is very great. The best is made on the shores of the Caspian. A considerable quantity is exported from the ports of the Black Sea to Germany and Italy, but only a small portion is brought to this country. *Imp.* duty, 35 per cent.

Caving-Rake, a barn-floor rake with long teeth and a short head to separate the chaff from grain.

Caxo, a Spanish measure of ore containing many quintals, but varying in bulk at different places, — at Potosi, equal to about 5,000 lbs.

Caya, a bastard satin-wood shipped from St. Domingo.

Cayenne Pepper. See CAPSICUM.

Caytongee, a name given in Sumatra to the second quality of pepper.

Fig. 65. — CEDAR OF LEBANON.

Cebadilla, Cevadilla, Sabadilla, Sevoeja, names for the follicular fruits of *Stenanthium frigidum*, *Asagræa officinalis*, and *Veratrum sabadilla*, of Mexico and Central America, which contain the poisonous alkaloid veratria, used as an emetic and purgative in mania, and which has also been administered in cases of gout, rheumatism, and neuralgia.

Cecograph, a French writing apparatus for the use of the blind.

Cedar [Fr. *cèdre;* Ger. *Ceder;* It., Port., Sp., *cedro*], a name applied to several distinct kinds of forest trees. The *C.* of Lebanon is a valuable species of pine, *Pinus cedrus* (Fig. 65), cultivated in gardens on account of its majestic appearance, but seldom for economical purposes, as it is slow of growth, and requires a free space for circulation of air. The wood has a fragrant odor, and is so bitter that no insect will touch it, — a circumstance which accounts for its great durability. The *C.* of Lebanon was, in ancient times, much employed in religious buildings, and most readers are familiar with the descriptions given of it for this purpose in Scripture. The tree is still to be found thinly scattered in the elevated valleys of Lebanon, Taurus, and other mountain-chains in Asia Minor. A second species, *P. deodara,* exists in the Himalayan mountains, where it is regarded by the natives with great veneration. The other kinds of *C.* do not belong to the pine family. The white *C.* of America, *Cupressus thyoides*, a noble tree of the Southern States, described under the heading CYPRESS. The Bermuda *C.*, *Juniperus Bermudiana,* is a large tree used for ship-building. The red *C.*, *Juniperus Virginiana*, of North America and the West Indies, is of great size and valuable. The wood is close, dark red, and odoriferous, and is much employed for cabinet work, wainscoting, and in the manuf. of pencils.

Cedar Gum, a gum resin obtained in the Cape Colony, from the branches and cones of the *Widdingtonia juniperoides*, much resembling gum olibanum. It is used for various medicinal purposes, for compounding plasters, and preparing varnish.

Cedar-Wood Oil, an aromatic essential oil, obtained by distillation from the wood of *Cedrela odorata.*

Cedra, or **Cedrat**, a species of Italian citron, having a thick rind, which contains much essential oil, and is used for making perfumes, and for flavoring liquors.

Cedrium, the resin of the cedar-tree, used to preserve books, and to protect other articles from insects.

Ceiling-Floor, the joists or frame-work on the lower surface of an apartment upon which the ceiling is made.

Ceiling-Laths, the thin strips of wood nailed to the joists for receiving the plaster.

Ceinture, a waist-belt, scarf, or girdle of gauze or muslin, cotton, linen, or silk.

Celature, the art of engraving, cutting, or embossing metals.

Celebes. See EASTERN ISLANDS.

Celemin, a Spanish dry measure, the 12th of a faneguda, ranging in different places from 3½ to 11 pints.

Celery [Fr. *céleri;* Ger. *Sellerie;* It. *selleri;* Port. *apio hortense;* Sp. *apio*], a sweet and wholesome vegetable (*Apium graveolens*), of which there are several varieties. The blanched footstalks of the leaves are used as an esculent. The red variety is coarse but hardy, and well adapted for stews and soups.

Celestine, a name for native sulphate of strontia. It is so called from the blue tint of many specimens, and is the source from which the nitrate of strontia employed in firework compositions is derived.

Cellar-Flap, the wooden lifting door which closes a cellar.

Celluloid, or **Celluloid Ivory**, a very curious material, of recent invention, which in normal appearance much resembles ivory. It is very light, and is susceptible of being colored in any shade, or produced in exact imitation of tortoise-shell, coral, amber, malachite, and other materials. It is not affected by heat, cold, or dampness; never becomes yellow or discolored; is strong, elastic, and durable; receives a beautiful polish, which improves with use, and is much less expensive than elephant ivory. *C.* is composed of paper tissue

and gum camphor, mingled with certain chemical ingredients, the whole being solidified by powerful pressure. The exact composition and manipulation of this article are secrets confined to the sole manufacturers, who now supply the *C.* in sheets of any desired size, thickness, or color, to about 15 companies, generally located in Newark, N. J., who are actively engaged in its conversion into articles of jewelry, combs, the backs of brushes, knife and fork handles, piano and organ keys, dental plates, trusses, harness trimmings, emery-wheels, chessmen, checkers, billiard-balls, collars, wristbands, etc.

Celone, a carpet in Italy.

Cembalo [It.], the harpsichord.

Cement [Fr. *ciment;* Ger. *Cement;* It., Sp. *cimento*], any substance that serves to bind or unite by cohesion, as glue, solder, mortars, etc. In building, *C.* is a concretion of rubble mortars; the name is also applied to hydraulic mortars, impervious to water, such as Roman and Portland *C.*, puzzolano, etc. A composition for uniting metals is called solder, and the name *C.* is given to a lute or paste surrounding bodies in pots or crucibles for chemical purposes. — The *C.* referred to below are among the most useful preparations of this class. In general, the thinner the stratum of interposed *C.*, the stronger is the junction of the surfaces operated on. This caution is necessary, as in their anxiety to unite broken articles persons generally defeat their object by spreading the *C.* too thickly on the edges of the fracture; whereas the least possible quantity should be used, so as to bring the edges as close as possible together.

Alabaster C. Take 1 part plaster of Paris in fine powder; make it into a cream with water, and melt and stir in it 2 parts yellow resin. Used to join or mend pieces of alabaster, white marble, porphyry, and other like substances, and to fill up cracks, supply chips out of corners, etc. It must be applied hot, the surfaces to be united having been previously warmed. See *Water-glass Cement.*

Architectural C. is a species of papier-maché, made from paper reduced to a smooth paste by boiling it in water, sifted whiting, and good size, equal parts, boiled to a proper consistence. It is used to make architectural ornaments, busts, statues, columns, etc. It is very light, and receives a good polish, but will not stand the weather unless it is well varnished or painted

Armenian, Diamond, Jewellers', Persian, Turkish C. The jewellers of Turkey, who are mostly Armenians, have a singular method of ornamenting watch-cases, etc., with diamonds and other precious stones, by simply gluing or cementing them on The stone is set in silver or gold, and the lower part of the metal made flat, or to correspond with the part to which it is to be fixed; it is then gently warmed, and the glue is applied, which is so very strong that the parts thus cemented never separate. This glue will strongly unite pieces of glass and china, and even polished steel, and may be applied to a variety of useful purposes. — *Original Armenian formula* Dissolve 5 or 6 bits of gum mastic, each the size of a large pea, in as much rectified spirit of wine as will suffice to render it liquid; and, in another vessel, dissolve as much isinglass, previously a little softened in water (though none of the water must be used), in French brandy, or good rum, as will make a two-ounce phial of very strong glue, adding two small bits of gum galbanum or ammoniacum, which must be rubbed or ground till they are dissolved Then mix the whole with a sufficient heat. Keep the glue in a phial closely stopped, and when it is to be used set the phial in boiling water. — *2d formula.* Isinglass, 1 oz.; distilled water, 6 oz.; boil to 8 oz., and add rectified spirit, 1½ oz.; boil for a minute or two, strain, and add, while hot, first a milky emulsion of ammoniac, ½ oz., and then tincture of mastic, 5 dr — When carefully made, this *C.* resists moisture, and dries colorless. As usually met with, it is not only of very bad quality, but sold at exorbitant prices.

Building C. or *Artificial Puzzolene* From a mixture of clay or loam, broken pottery, flints, or siliceous sand, or broken bottle-glass, and wood ashes, exposed to a considerable heat in a furnace, until it becomes partially vitrified; it is then ground to fine powder, sifted, and mixed with one third its weight of quick-lime, also in fine powder, after which it must be packed (tight) in casks to preserve it from the air and moisture For use it is mixed up with water and applied like Roman *C.*

Chemical C., Soft C. Melt together 4 parts yellow wax, 2 parts common turpentine, and 1 part Venetian red (well dried) Used as a temporary stopping or lute for the ends or joints of tubs, which are not exposed to much heat; as in alkalimetry, etc See *Electrical C.*

Chinese C., Liquid Glue, Shell-lac C., consists of finest pale orange shell-lac (broken small), 4 oz; rectified spirit (strongest) 3 oz; digested together in a corked bottle in a warm place until dissolved. Very strong and useful; almost odorless. It should have about the consistence of treacle. — *2d formula* As before, but using rectified wood naphtha as the solvent. Inferior to the last, but excellent for many purposes. — *3d formula.* Macerate for several hours 6 parts of glue, in small pieces, in 16 parts of water; then add 1 part of hydrochloric acid, and 1½ parts of sulphate of zinc; and let the mixture be kept for 10 or 12 hours at a temperature of 68° or 70° C. — It is employed to mend glass, china, fancy work, jewelry, etc., for which it is only inferior to Armenian cement. The first formula produces a *C.* so strong that pieces of wood may be joined together, cut slopingly across the grain, and will afterwards resist every attempt to break them at the same place. In many of the islands of the Indian Ocean, in Japan, China, and the East Indies, a similar cement is used to join pieces of wood for bows, lances, etc. The fluid is thinly smeared over each face of the joint, a piece of very thin gauze interposed, and the whole pressed tightly together and maintained so until the next day. Joints so made will even bear the continual flexure of a bow without separating. It is admirably adapted for fishing rods. The product of the second formula is commonly sold as *liquid glue.* That of the last is much used by the druggists and oilmen, instead of gum, for fixing paper labels to tin, and to glass when exposed to damp.

Coppersmiths' C., Blood C., is made from bullock's blood thickened with finely powdered quick-lime. Used to secure the edges and rivets of copper boilers, to mend leaks from joints, etc. It must be used as soon as mixed, as it rapidly gets hard. It is cheap and durable, and is suited for many other purposes.

Curd C. Take ½ pint of the curd of skimmed milk (obtained by the addition of vinegar or rennet) and rub it with a cold solution of borax, till a thick liquid is obtained, that becomes clear on standing. This is an excellent cement for artificial meerschaums, and may be used to give consistency to silk goods, or to coat artificial flowers and court-plaster, to the latter of which it imparts more adhesiveness and firmness

Cutlers' C Take black resin, 4 lbs; beeswax, 1 lb.; melt, and add finely powdered and well-dried brick-dust, 1 lb.; mix well. It is used to fix knives and forks in their handles. It is put into the hollow of the handle, and the metal, previously made hot enough to melt the composition, pressed into its place whilst warm, and the whole kept upright and still until quite cold.

Diamond C. See *Armenian C*

Electrical C. From black resin, 7 lbs.; red ochre, 1 lb.; plaster of Paris, ½ lb. (both well dried and still warm); melted together, and the heat and agitation continued until all frothing ceases, and the liquid runs smooth; the vessel is then withdrawn from the fire, and the mixture stirred until cooled sufficiently. Used to cement the plates in galvanic troughs, join chemical vessels, etc.

Engineers' C. consists of equal weights of red lead and white lead, mixed with boiled linseed oil, to a proper consistence. Used by engineers and others to make metallic joints. A washer of hemp, yarn, or canvas, smeared with the cement, is placed in the joint, which is then "brought home," or screwed up tight. It dries as hard as stone. It also answers well for joining broken stones, however large Cisterns built of square stones, put together, while dry, with this *C.*, will never leak or come to repair.

Flour C., Paste, Flour Paste. This useful and well-known article is made by mixing about a tablespoonful of wheat flour with cold water, say ½ pint, adding the latter gradually, and thoroughly stirring in each portion before pouring in more; the vessel is then placed over the fire, and the whole assiduously stirred until it boils, great care being taken to prevent caking on the bottom, or burning Some persons add about ½ of a teaspoonful of powdered alum to the water, which is said to strengthen the product; the shoemakers add a little quantity of powdered resin to the flour, with the same intention The addition of a little brown sugar and a few grains of corrosive sublimate will prevent it turning mouldy, and is said to preserve it for years. When too hard or dry, it may be softened by beating it up with a little hot water.

French C is a mucilage of gum Arabic, thickened with starch-powder or farina; a little lemon-juice is sometimes added Used by naturalists in mounting specimens; by artificial flower makers; and by confectioners, to stick paper, wafer papers, ornaments, etc. on their fancy cakes. Plain mucilage is often used in the same way.

Hydraulic C. Hydraulic mortars or *C* are those which set or become hard under water Common lime does not possess this property; but limestone containing from 8% to 25% of alumina, magnesia, and silica, yield a lime on burning, which does not slake when moistened with water, but forms a mortar with it, which hardens in a few days when covered with water, although it does not acquire much solidity in the air. Puzzo-

lana, septaria, and argillaceous or siliceous earths, burnt, either with or without the addition of common limestone, and then ground to powder, form excellent hydraulic *C.* A very good hydraulic mortar is made by slaking lime with water containing about 2 per cent of gypsum, and adding a little sand to the product. The presence of the gypsum tends to delay the slaking of the lime, and also to harden the substance formed after the slaking.

Japanese C., Rice Glue. From rice flour, mixed with a little cold water, and boiling water, gradually poured in until it acquires proper consistence; when it is boiled for 1 or 2 minutes in a clean saucepan or earthen pipkin. It is beautifully white, and almost transparent, for which reason it is well adapted for fancy paper work, which requires a strong and colorless *C.* It is superior to French *C.*

Mahogany C. Melt 4 oz. beeswax; then add 1 oz. Indian red, and enough yellow ochre to produce the required tint. It is used to fill up holes and cracks in mahogany furniture by the cabinet-makers. Red putty is also used for the same purpose.

Major's Centennial C. Under this name a *C.* whose formula is not given. It is very strong and effective for repairing glass, china, furniture, billiard-cues, etc.

Parker's C. is made of the nodules of indurated and slightly ferruginous marl, called by mineralogists "septaria," and also of some other species of argillaceous limestone. These are burnt in conical kilns, with pit coal, in a similar way to other limestone, care being taken to avoid the use of too much heat, as if the pieces undergo the slightest degree of fusion, even on the surface, they will be unfit to form the *C.* After being properly roasted the calx is reduced to a very fine powder by grinding, and immediately packed in barrels, to keep it from the air and moisture. This *C.* is tempered with water, and applied at once, as it soon hardens, and will not bear being again softened down with water. For foundations and cornices exposed to the weather it is usually mixed with an equal quantity of clean angular sand; for use as a common mortar, with about twice as much sand; for coating walls exposed to cold and wet, the common proportions are 3 of sand to 2 of *C.*, and for walls exposed to extreme dryness or heat, about 2½ or 3 of sand to 1 of *C.*; for facing cistern-work, water frontages, etc., nothing but *C.* and water should be employed. Under the name of *Compo*, or *Roman C.*, it is much employed for facing houses, water cisterns, setting the foundations of large edifices, etc.

Plumbers' C. consists of black resin melted with about an equal weight of brick-dust. Sometimes a little pitch or tallow is added.

Portland C. is made from clay or chalk, or argillaceous river-mud and chalk or limestone, calcined together, and then ground to powder. See *Parker's C.*

Roman C. Genuine Roman *C.* consists of puzzolene (a ferruginous clay from Pozzuoli, calcined by the fires of Vesuvius), lime, and sand. The only preparation which the puzzolene undergoes is that of pounding and sifting. It is generally mixed up with water, like most other cements, but occasionally with bullock's blood and oil, to give the composition more tenacity. That imported from England is now generally prepared from the septaria of either Harwich or Sheppy, or of the lias formation, or from the cement stone found in the upper division of the lias formation, or in the shale beds of the Kimmeridge clay. It is also prepared from several artificial mixtures of ferruginous clay and lime, calcined together. It must be kept in close vessels, and mixed with water when used. *Imp.* duty, 20 per cent. See *Parker's C.*

Steam-boiler C. Take litharge in fine powder, 2 parts; very fine sand and quick-lime (that has been allowed to slake spontaneously in a damp place), of each 1 part; mix and keep it from the air. Used to mend the cracks in boilers and ovens, and to secure steam joints. It is made into a paste with boiled oil before application.

Stucco C. is a compound of powdered gypsum or strong gelatine. It is used for coating walls, and also for ornamenting ceilings. It takes a high polish, and colored designs can be painted on it. When employed on walls a coarser kind is first laid on, which is followed by a coating made of choicer specimens of gypsum, or glue, or isinglass. When this latter and outer coat becomes dry it is polished with pumice, tripoli, and linen. The color is incorporated with the outer coatings of the stucco by mixing the metallic pigments with it, and then applying it to the wall, after which a very thin coating of gypsum and isinglass, or sometimes of oil, is given to it, and when the whole is partially dried the tint is brought out by polishing, as before stated. Generally the finest effect is obtained by oil.

Water-glass C. For glass, earthen-ware, porcelain, and all kinds of stone-ware, these *C.* are excellent. For glass and marble a *C.* is prepared by rubbing together one part of fine pulverized glass, and two parts of pulverized fluor-spar, and then adding enough water-glass solution to give it the consistency necessary in a *C.* Water-glass mixed with hydraulic *C.* to a thick dough makes a good cement for the edges and joints of stone and marble slabs. It is well to mix but little at a time, as it hardens very quickly.

Water-proof C. The celebrated "water-proof *C.* of Dihl" consists of porcelain clay or pipe-clay, dried by a gentle heat, and powdered, mixed up to the consistence of a paste with boiled linseed oil, and, sometimes, a little oil of turpentine. It is colored by adding a little red or yellow ochre, or any similar pigment. It is used to cover the fronts of buildings, roofs of verandas, etc.

Cementation is the process of converting iron into steel by being heated, in the form of bars, for several hours with charcoal powder in a chest of refractory clay. The result of the operation is called *blistered-steel*, from the appearance of the surface.

Censer, a chafing-dish or pan attached to a chain, used for burning incense in religious ceremonies.

Census, an enumeration or statistical account taken occasionally or periodically, of persons or things; as of population, land under crop, stock, and produce. In this country, a general *C.* is taken every ten years, in accordance with the provisions of the Constitution, and the 9th *C.* was taken in 1870.

Cent, the hundredth part, an abbreviation of the Latin *centum*; used as a prefix to many words, weights, coins, etc. — A copper or nickel coin of the U. States, equivalent to 10 mills or the 100th part of a dollar. — A money of account in Holland, the 100th part of a guilder or florin. — *Per cent.* A certain rate by the hundred, as *five per cent*, the 20th part of 100. See CENTIME.

Centage, a rate by the hundred; *percentage* being a commission or allowance at so much per cent.

Centaury, a wild plant of Europe, the *Erythræa centaurium*, which is very bitter, and is sold by herbalists.

Centenaar, the old Amsterdam hundred-weight or quintal, equal to nearly 109 lbs. avoirdupois. See CENTNER.

Centesimal, a division into hundredth parts.

Centiare, the metre superficial, the hundredth part of the French are = 1.19 sq. yards.

Centigrade, the division into grades or degrees by hundredth parts, called also *centesimal*. — A name for the thermometer of Celsus, used chiefly in France. The distance between the freezing point of water and the boiling point is divided 100 degrees, each being equal to 1⅘ of Fahrenheit's scale. See THERMOMETER.

Centigramme, the hundredth part of the French gramme = 0.15 grain.

Centilitre, the hundredth part of the French litre = 0.017 pint, also 0.617 cubic inch.

Centime, a French copper coin rarely seen in trade, the fifth part of a cent, 100 centimes making a franc. The *C.* is also used in accounts in Belgium, Switzerland, Italy, Austria, and other countries which have adopted the French decimal system.

Centimetre, a linear measure in France, the hundredth part of the metre = 0.39 inch. In Holland the legal name of the *C.* is *duim* or *ponce*.

Centisimo, an Italian money of account, the hundredth part of the lira = ⅕ cent

Centistere, the hundredth part of the French stere = 0.353 cubic foot.

Centner, the commercial hundred-weight or quintal of several European States, which varies in most. The *C.* of Germany is 110¼ lbs. avoirdupois; that of Austria, 123½ lbs.

Central Pacific R.R., runs from San Francisco, California, to Ogden, Utah, 882.89 m.; Oregon Division from Roseville to Redding, Cal., 152.22 m.; Visalia Div., Lathrop to Goshen, Cal., 146.08 m.; San José Div., Niles to San José, 17.54 m.; branches, 14.65 m.; total, 1,213.38 m. This

Co., whose offices are in San Francisco, was formed in 1870 by the consolidation of the Central Pacific, the California & Oregon, the San Francisco & Oakland, the San Francisco & Alameda, and the San Joaquin Valley R.Rs., and in connection with the Union Pacific R.R. forms a continuous line from San Francisco to Omaha, Neb., in length 1,916 m., and there connecting with the lines eastward. This Co. also operates the California Pacific, the Northern, and the Stockton & Copperopolis R.Rs. *Financial statement:* — Cap. stock, \$54,275,500; funded debt, \$54,885,000; United States subsidy bonds, \$27,855,680; other liabilities, current accounts, etc., \$11,598,220.01; sundry accounts, \$337,039.75. Funded debt in detail: convertible mortgage issued 1872, \$1,483,000, payable 1883, interest 7% (Jan. & July); California State aid, issued 1864, \$1,500,000, payable 1884, interest 7% (Jan. & July); 1st mortgage (Cen. Pac.), ser. A, issued 1865, \$2,995,000, payable 1895, interest 6% (Jan. & July); 1st mortgage (C. P.), ser. B, C, D, issued 1866, \$3,383,000, payable 1896, interest 6% (Jan. & July); 1st mortgage (C. P.), ser. E, issued 1867, \$3,997,000, payable 1897, interest 6% (Jan. & July); 1st mortgage (C. P.), ser. F, G, H, I, issued 1868, \$15,508,000, payable 1898, interest 6% (Jan. & July); 1st mortgage (West. Pac.), old, issued 1865, \$112,000, payable 1895, interest 6% (June & Dec.); 1st mortgage (W. P.), ser. A & B, issued 1869, \$2,623,000, payable 1899, interest 6% (Jan. & July); 1st mortgage (Cal. & Oreg.), ser. A, issued 1868, \$6,000,000, payable 1888, interest 6% (Jan & July); 1st mortgage (C. & O.), C. P., ser. B, issued 1872, \$2,000,000, payable 1892, interest 6% (Jan. & July); 1st mortgage (S. Fr., Or. & Ala.), issued 1870, \$500,000, payable 1890, interest 8% (Jan. & July); 1st mortgage (San Joaquin Valley), issued 1870, \$6,080,000, payable 1900, interest 6% (Apr. & Oct.); land trust mortgage, issued 1870, \$10,000,000, payable 1890, interest 6% (Apr. & Oct.). Total amount of bonds issued, \$55,457,000.

Central Vermont R.R. runs from Windsor, Vt., to Rouse's Point, N. Y., 158 m.; branches and leased lines, 276 m.; total, 433 m. Offices at St. Albans, Vt. This Co. took its title in July, 1873. The Vermont Central R.R. was originally chartered in 1843, and in 1849 leased the Vermont & Canada R.R., then under construction, agreeing to pay an annual rental of 8% on cost. This lease has been the subject of litigation since 1854. The Vermont Central having defaulted on its rental and interest on its mortgage bonds, the Trustees took possession of the two roads in 1852, and it was operated by them until July, 1873, when, by virtue of an act of the Legislature of Vermont, and under the direction of the Court of Chancery of that State, the Central Vermont Co., as Receivers and Managers, took possession and have since operated the road. — *Financial statement*, 1878. Funded debt: —

Equipment bonds	\$2,000,000
Guaranteed bonds	905,000
Income and extension bonds	1,006,000
	\$3,911,000
Old 1st mortgage bonds, issued in 1851	\$3,000,000
Old 2d mortgage bonds, issued in 1852	1,500,000
Net earnings for year ending Dec. 31, 1878	\$618,0[illegible]6.68

Centre-Bit, a carpenter's tool for boring circular holes.

Centrifugal Machine, a whirling machine for drying sugar, or clearing it from molasses. The sugar is enclosed in cylindrical strainers, a rapid rotary motion is imparted, by which the moisture is thrown off more speedily than by the old process of leaving the molasses to drain away from the sugar gradually in flat coolers and casks.

Centrifugal Pump, an engine so constructed as to raise water by centrifugal force, aided by the pressure of the atmosphere.

Centripetal Press, a mechanical contrivance for pressing square in all directions.

Centum [Lat.], a hundred.

Ceramics, a word used in the arts, to express all the varieties of the potter's trade which have been burnt or roasted in a kiln. These productions are of great beauty and delicacy, and they often display the highest artistic talent.

Cerasin, a name given to such gums as cherry-tree gum, which swell in water, but do not readily dissolve.

Cerate, a thick species of ointment containing wax. Cerates are intermediate in consistence between ointments and plasters; but are less frequently employed than either of those preparations. The medicinal ingredients which enter into the cerates are very numerous; indeed, almost every kind of medicine capable of exercising a topical effect may be prescribed in this form.

Cereal, pertaining to edible grain; the grasses which produce bread-corn, and are the object of a continuous culture for food, as wheat, rye, barley, Indian corn, oats, rice, and millet, are called cereals.

Cerin, a white crystallizable substance, which is a chief constituent of wax; beeswax containing nearly 80 per cent of *C.*

Cerisin, a substance obtained from ozokeri or fossil wax, very similar in appearance and properties to white wax, for which it has been proposed as a substitute in pharmaceutical preparations. At present it is chiefly used in the manuf. of candles.

Ceroon, Seron, or **Seroon**, a kind of skin package; a bale formed of pieces of wood, covered or fastened with hide. Cochineal, cacao, indigo, and various drugs are imported in this form. Sometimes a matted bale of almonds, or a pannier of raisins, weighing about 87½ lbs., is called a *C.*

Ceroxyline, a resin of palm-wax.

Certificate, a written testimony properly authenticated; as, a *C.* of stock in a bank, a shipmaster's *C.* — *C. of registry* is a *C.* that a ship has been registered as the law requires. Under the U. States Statutes, "every alteration in the property of a ship must be indorsed on the *C.* of registry, and must itself be registered." Unless this is done, the ship or vessel loses its national privilege as an American vessel. — *C. of Origin*, in England, a custom-house document, testifying to particular articles being the growth of a British colony.

Certified Check. See CHECK.

Ceruleum, a blue Roman pigment, a silicate of copper.

Ceruse. See WHITE LEAD.

Cerussite, a valuable ore of lead.

Cervesa, the Spanish name for beer or ale.

Cessio Bonorum, a process in Scotland by which the effects of an insolvent debtor, who does not come under the system of sequestration applicable to traders, is divided among his creditors.

Cessionnaire, in France, an assignee or receiver.

Cette. See FRANCE.

Cevadilla. See CEBADILLA.

Ceventeria, a name in Italy for rouge, or paint for the face.

Ceylon, a large island belonging to Great Britain, lying near the S. point of India, from which it is separated by the Gulf of Manaar, between

lat. 5° 56′ and 9° 50′ N., lon. 79° 41′ and 81° 54′ E. Extreme length from N. to S., 266 m.; average breadth, 100 m.: area, 24,702 sq. m.; pop., 2,459,542, of which 19,000 are whites; the remainder, chiefly Singalese, Malabar and other Hindoo tribes, Moors, and Vadahs. The chief town and seat of government is Colombo. The administration is vested in a governor, assisted by executive and legislative councils.

The coasts of *C.* are on the N. and N. W. low and flat, on the S. and E. bold and rocky, and present some good harbors. A ridge of dangerous sand-banks, called Adam's Ridge, crosses from *C.* to the island of Ramisseram on the mainland of Hindostan. This shoal has three channels, but is generally impracticable for navigation. The centre of *C* is occupied by an extensive table-land, 67 m. long by 50 wide, at an elevation of from 2,000 to 3,000 feet above sea-level. For a tropical country, *C.* has a comparatively salubrious climate, but the low lands of the sea-board are quite unhealthy. Of its mineral wealth little is known. *C.*, however, is rich in precious stones. The gems

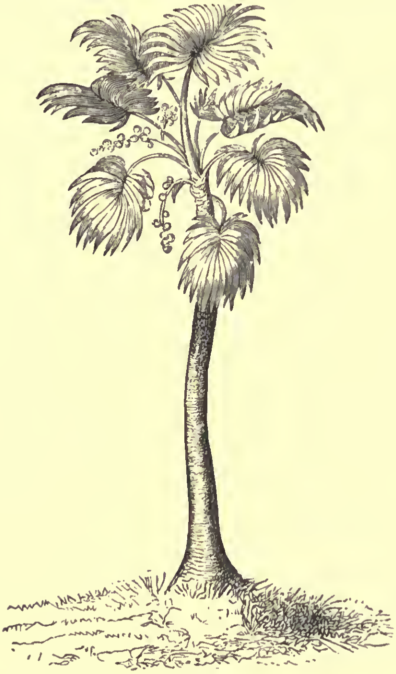


Fig. 66. — Palmyra-Tree.

most esteemed are the ruby and cat's-eye; but there are likewise found the amethyst, topaz, garnet, cinnamon-stone, sapphire, and diamond; and the pearl and chank fisheries in the Gulf of Manaar are among the most celebrated in the world. *C.* is rich in vegetable productions. Of these the most important, next to coffee, rice, and other grain, is cinnamon (called by the natives *corundoo*), which here arrives at its greatest perfection, and has always been a chief article of export. It delights in a poor sandy soil, with a moist atmosphere, and is almost exclusively confined to the S.E. part of the island. The cocoa-nut tree flourishes here in perfection, and is of prime importance to the natives, almost every part of the tree being converted into articles of food or domestic use. The Palmyra (Fig 66) and Talipot palms, and the bread-fruit, are also found in their most luxuriant growth. Cotton is cultivated, but it is not equal to that of India. Indigo, betel, tobacco, gum-lac, gamboge, and cardamoms, all of excellent quality, are produced. The commerce of *C.* is mainly with Great Britain and India. Its exports in 1878 amounted to $22,547,975, consisting chiefly of coffee, cocoa-nut oil, and cinnamon. *C.* had, in 1879, 106 m. of railroad open for traffic, and 32 under construction. The chief ports are Colombo, Trincomalé, and Point-de-Galle.

Colombo, in lat. 6° 57′ N., lon. 80° E., where nearly the whole maritime trade of the island is carried on, has a wooden quay adapted for vessels not exceeding 100 tons; larger vessels anchor in the small, semicircular bay within which the quay is built or in an outer roadstead, which, however, is safe only during the N.E monsoon, from Nov. to the end of March. The climate is salubrious. Pop., 40,000.

Weights and Measures are the same as those of Great Britain. The *money* is the rupee of British India.

Ceylon Moss, a small and delicate fucus, believed to be the *Gracelaria lichenoides*, obtained in the salt lakes, on the coasts of Ceylon, which contains a large proportion of true starch, and is used for jellies.

Ceylon Stone, a general name given to many fine minerals and jewels obtained in the island of Ceylon; specially applied, however, to a species of black spinelle.

Cha, a kind of tea rolled up like tobacco, which goes to the interior of Asia.

Chablis. See Burgundy Wines.

Chabutarah, or **Chubootura**, in India, a market-place, custom-house, or police-station.

Chaco, an unctuous earth of La Paz, Bolivia, which is made into little pats, and eaten with chocolate.

Chacoli, a light Biscayan wine of two kinds, red and white.

Chafe, to rub or damage the surface of anything.

Chaff, the pericarp or dry calyx of grain removed by thrashing and winnowing, which has many medicinal and economical uses. It is occasionally mixed with mortar, and employed as a substitute for hair in making plaster for rooms, and sometimes used for stuffing beds.

Chaffer, to bargain; to cheapen; to haggle.

Chaffery, a name given to that part of a foundry where the forges are placed for hammering iron into bars.

Chafing-Dish, a vessel for holding charcoal or coal to give heat.

Chagreen. See Shagreen.

Chagres. See Colombia (U. States of).

Chain, a line of connected links of any kind. — A lineal measure used in surveying or plotting, made of links of iron wire united together. The surveyor's *C.* contains 22 yards or 792 inches, which, being divided into 100 links, gives 7.92 inches for each link. The square *C.* is the 10th of an acre, or 484 sq. yards.

Chain-Boat, a substantial boat used in harbors for getting up mooring chains or anchors.

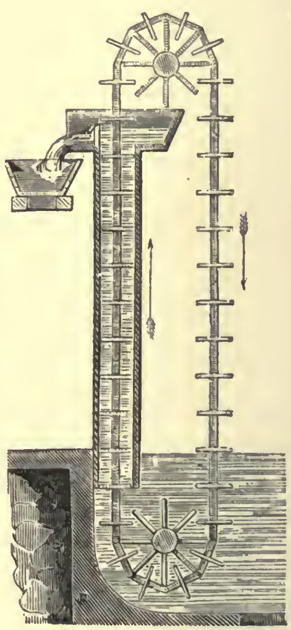


Fig. 67. — Chain-Pump.

Chain-Bolts, the large bolts used to secure to the ship's side the links, or dead-eyes, through which the standing rigging is rove.

Chain-Bridge, a suspension-bridge.

Chain-Cable, a mooring or anchoring cable made of stout iron rings. See Cable.

Chain-Plates, strong thick plates of iron used in merchant-vessels, bolted to the ship's side, instead of chains to the dead-eyes, for holding the blocks by which the rigging of the mast is secured. They take their name from the mast, and are hence called fore-chains, main-chains, or mizzen-chains.

Chain-Pump, an hydraulic machine (Fig. 67) for raising water to a small height.

Chain-Rule, or Rule of Equations, an arithmetical formula, which is of great practical utility, particularly in exchange operations. It is so called from the terms being stated as equations, and connected, as it were, by a chain, so as to obtain by one operation the same result as by any number of different questions in the rule of three. The principle may be familiarly illustrated as follows: —

Required the number of Grecian drachmas which may be had for \$300, reckoning \$1 = 5 French francs, and 100 francs = 112 drachmas.

This case contains obviously two different questions:—

1. If 5 francs be equivalent to \$1, how many francs may be had for \$300?

1 : 300 : : 5 : 1500. *Answer*, 1500 francs may be had for \$300.
5
———
1)1500(1500

2 If 100 francs be equivalent to 112 drachmas, how many drachmas may be had for 1500 francs?

100 : 112 : : 1500 : 1680. *Answer*, 1680 drachmas may be had for 1500 francs.
1500
———
100)168,000(1680

Which is evidently the answer originally required, as 1500 francs are equivalent to \$300, the original *term of demand*.

In the course of these operations, the term of demand, 300, is first multiplied into 5, then divided by 1, next multiplied into 112, and afterwards divided by 100. But it would obviously produce the same result to collect the mutipliers and the term of demand into one product, and the divisors into another, and then to divide the former by the latter. The preceding case may therefore be stated thus: —

		\$300 ?
\$1	=	5 francs
100 francs	=	112 drachmas

And $\frac{300 \times 5 \times 112}{1 \times 100} = \frac{168,000}{100} = 1680$, as before.

By this mode of arranging the terms, it is obvious that those which would form the divisors in continued statements in the Rule of Three are multiplied together for a common divisor, and the other terms for a common dividend.

The same reasoning may be applied to those cases which involve three or more different questions. Hence the following

General Rule. — Arrange the several terms into two columns of antecedents and consequents, in this manner: —

1. In the right-hand column enter first the *term of demand*.

2. On the line below, and in the left-hand column, enter the first antecedent, which must be of the same denomination as the term of demand, and equal in value to the corresponding consequent placed contiguously in the right-hand column.

3. Similarly make the second antecedent of the same denomination as the preceding consequent, and equal in value to the annexed consequent, and so on throughout, introducing equations according to the nature of the case, and making the terms lead from one to another, so that the last term may be of the same denomination as the answer required.

Then multiply the antecedents together for a divisor, and the consequents, including the term of demand, together for a dividend, and the quotient will be the answer required.

Example — Required the price per lb. avoird. of tea purchased in Japan at 30 yens per pecul of 133 lbs; 260 yens being equal to 1,000 Dutch florins, and the rate of exchange 38.5 per florin?

Arranging these data according to the preceding rules, we have, —

		1 lb. ?
133 lbs.	=	1 pecul
1 pecul	=	30 yens
260 yens	=	1000 florins
1 florin	=	38.5 cents

$\frac{1 \times 1 \times 30 \times 1000 \times 38.5}{133 \times 1 \times 260 \times 1} = \frac{11,550,000}{34,580} = 33.4$ cts., the price per lb required.

The operations are in practice simplified by striking out the same numbers when they occur in different columns; or when terms in different columns are measured by the same number, by cancelling the original terms, and using the quotients in their stead. Fractions likewise are generally converted into whole numbers by multiplying both terms of the equations in which they occur by the denominator. Thus, multiplying the first equation of the preceding case by 3, we have 400 lbs. = 3 peculs.

The chain-rule admits of being applied advantageously to a great variety of cases in commercial arithmetic, but it is in questions of exchange that it is chiefly employed.

Chain-Shot, large iron balls or bullets chained together, used in sea-battles to destroy the spars, rigging, etc. of an enemy's vessel.

Chain-Timber, large joists used in the middle stories of a building, to bind and give it strength.

Chain-Work, a style of fabric made with open spaces like chain-links, of which tambouring, net, and hosiery are examples.

Chair, a movable seat, of which there are numberless kinds made to suit special uses, such as light and ornamental drawing-room chairs, heavy and substantial office chairs, dining-room chairs, and folding, rocking, and reclining chairs, hall chairs, shop chairs, garden chairs, etc. — A heavy cast-iron socket for receiving and securing the bars of a railroad.

Chairman, the presiding officer of a company, board of directors, or public meeting.

Chaise, an obsolete name for a light two-wheeled pleasure-carriage drawn by one horse.

Chaise-Longue [Fr.], a couch or sofa with one arm or end.

Chakkara, the Malabar name of a coarse sugar made from the tari or juice of the cocoa-nut and other palms.

Chalan, Chillaum, or **Chulan**, a common East-Indian name for an invoice, pass, voucher, or way-bill.

Chaland, a large barge or lighter used on the French rivers for the transport of goods, and towed by steam or horses.

Chalcedony, or **Calcedony**, a kind of semi-transparent quartz, which occurs of various colors, but usually milk-white. It is often banded with concentric laminæ of two or more colors, when

it is called *Agate.* The red and yellow varieties are called *Carnelian,* and those of a deep brownish-red, *Sard.* Agate, Cat's-eye, Chrysoprase, Flint, Hornstone, Onyx, and Plasma are all varieties of chalcedony.

Chalcography, the art of engraving on brass and copper.

Chaldron, a heaped measure for various dry goods = 36 bu., but now more usually employed as a weight for coals; the London *C.* being 25½ cwt., the Newcastle *C.* of 3 wains 52½ cwt., but for boats estimated at 53 cwt. The ordinary weight required in the markets of the U. States is 2,940 lbs.; but at New York the *C.* of coals is only 2,500 lbs.

Chaldron-Wagon, a wagon which conveys the coal from the pit's mouth to the place of shipment, and holds a chaldron of coals.

Chalice, a sacramental cup used in the celebration of the Eucharist.

Chalk, [Fr. *craie;* Ger. *Kreide;* It. *creta;* Port. *creda;* Sp. *greda*], is a massive opaque carbonate of lime, of a white, grayish, or yellow color, having an earthy fracture. Sp. gr. 2.5. It varies much in hardness, but is generally soft to the touch, and adheres to the tongue. *C.* forms the basis of whiting, crayons, and some white colors. In medicine it is used in the form of prepared *C.* and compound *C.* powder, as an astringent and antacid. In agriculture, *C.* is extensively used in Europe, being added in many instances to the soil to alter the constituents and to fertilize land. *C.* does not exist in America, but is extremely abundant in England and France, whence it is imported in bulk, generally as ballast. *Red C.* is an ochreous clay used in an indurated state by painters, builders, etc. — *French C.* See SOAPSTONE. *Imp.* duty, white, unmanuf., free; red and French *C.*, 20 per cent; all manuf. of *C.*, 25 per cent.

Chalk-Cement, an hydraulic cement made of chalk, which hardens under water in a few minutes.

Chalk-Drawing, a drawing sketched and filled in with black and colored crayons.

Chalk-Lime, the burnt carbonate or chalk from which heat has driven off the carbonic acid.

Chalk-Line, a carpenter's line which is chalked so as to leave a mark for working by.

Challis, a fine printed soft woollen fabric, used for ladies' dresses.

Chaloupe, the French name for the long-boat of a ship.

Chalybeates, mineral waters and medicines which hold iron.

Chama, the Malabar name for the *Panicum miliaceum,* the seed of which is sometimes used as a substitute for rice. — Also a very large bivalve found in the Indian ocean, the shells of which are used for *Cénitiers.*

Chambard Fabrics are stuffs made from soft worsted yarn in Saxony by hand weavers at their houses.

Chamber, an apartment in an upper story of a dwelling-house. — A cell or cavity at the bottom of the bore of a gun to receive the charge of powder. — A receptacle formed in a mine to receive a charge of powder. — The inside of a lock, a partition in a canal.

Chamber-Hangings, the curtains or tapestry of a sleeping-room.

Chamber of Commerce, or **Board of Trade,** a body of merchants and traders, associated for the purpose of promoting the interests of its own members, of the town or district to which it belongs, and of the community generally, in so far as these have reference to trade and merchandise. Of the means by which these objects are sought to be accomplished, the following may be mentioned as the most prominent: 1. By representing and urging on the legislature the views of their members in mercantile affairs; 2. By aiding in the preparation of legislative measures having reference to trade, as, for instance, the much wanted National Bankrupt Law; 3. By collecting statistics bearing upon the staple trade of the district; 4. In some places, by acting as a sort of court of arbitration in mercantile questions; 5. By attaining by combination advantages in trade which might be beyond the reach of individual enterprise. The oldest *C. of C.* on record was that of Marseilles, in France, which dates from the end of the 14th or beginning of the 15th century. The oldest in Great Britain is believed to be that of Glasgow, which was chartered in 1783. The oldest in America is that of New York, which was organized in 1768, and incorporated by royal charter in 1770; its legitimate influence has been since continually exercised for the benefit of mankind. The copious and well digested annual reports, which, since 1858, have been uninterruptedly issued by the New York *C. of C.*, offer the best statistical commercial periodical for reference issued in this country.

Chambrays, plain ginghams with white woof and colored warp.

Chamois, or SHAMMY LEATHER, is leather made from the skin of the *chamois,* a species of antelope inhabiting the high mountains of W. Europe, but also from sheep and doe skins dressed with fish-oil. The oil is hammered or beaten by a mill into the pores of the skin, which is afterwards partially dried, and washed in strong alkali, when it becomes very soft and pliable.

Chamomile, a useful herb, *Anthemis nobilis,* cultivated in Europe for its flowers, which are bitter, stomachic, and tonic.

Champagne Wines. These wines, which rank first in excellence among the wines of France, are the produce of the vineyards of the old province of Champagne, comprising the departments of Ardennes, Marne, Aube, and Haute Marne. *C.* wines are divided into sparkling (*mousseux*), demi-sparkling (*demi mousseux*), and still wines (*non mousseux*). Some are white or straw-color, others gray, others rose-color, and some are red. They are of light quality in respect to spirit, their average of alcohol generally being but 12.61 per cent. The entire quantity of wine made in *C.* of all kinds varies with the season; but the average may be taken at 30,000,000 gallons from 140,000 acres of vines. The most famous of these wines are made in the arrondissements of Epernay and Rheims. Though in America most people understand by *C.* only wine which effervesces, this, as we have seen, is an error. There are many kinds of *C.* wine, but the best are those which froth least. They are improved in the drinking by ice, which tends to repress the effervescence; the Sillery has no sparkle at all. Every connoisseur in *C.* will select wine of moderate effervescence, and such wine carries the best price. When the glass is entirely filled with froth, on pouring out the contents of the bottle, the better qualities of the wine and the spirit evaporate. The quantity of spirit in *C.* is but small, and the residue is a flat, meagre fluid. It is on the banks of the river Marne that the best effervescing wines are made. The French divide this district, or vine-ground of Rheims, into four general divisions, namely, the river vineyard district, that of the mountain of Rheims, that of the estate of St. Thierry, and that of the valleys of

Norrois and Tardenois. The river district is situated on a calcareous declivity open to the south, at the foot of which runs the Marne. On this declivity come first in order the vineyards of *Ay*, *Mareuil*, and *Dizy*, which produce *C.* wine of the very first quality known. They are light and delicate, vinous, of the most agreeable taste, and preserve to a great age their virtues and effervescence. When these wines are destitute of the sparkling quality, they rival those of Sillery, or still *C.*, and are frequently preferred to Sillery, because they are lighter and more luscious. The next vine lands in rank in this district are those of *Cumières* and *Hautvilliers*, which yield red wine of the 2d quality. Hautvilliers was the spot where, towards the end of the 17th century, the Benedictine monk Dom Perignon, first introduced the mixing grapes of different qualities in making *C.* wine, and discovered that the best white wine could be made from the blackest grapes. The mountain or hilly district of Rheims is at the back of the preceding declivity, and its soil is of the same calcareous description. The aspect is E. and N. The best vine lands are those of *Bouzy*, *Ambonnay*, *Verzenay*, *Sillery*, *Mailly*, and *Verzy*. It is here that the best red wines of *C.* are produced. They have good body; are spirituous, fine, and keep their qualities to an advanced age. Here, also, is produced the white still *C.* called Sillery. This wine has more body, is more spirituous than any other white *C.* wine, and is distinguished by a dry and agreeable taste. It is grown principally on the lands of Verzenay and Mailly, of the blackest grape, of which, also, the gray bright wine, having the complexion of crystal, is made. Very little is now produced in the commune of Sillery. The grape is subjected for making this wine to a less pressure than for red wine, and it is kept longer in wood than the other sorts are, or about 3 years. It is perhaps the most durable, as well as wholesome to drink, of all the wines of *C.*, the fermentation being more perfect than that of any other species. At *Epernay*, where the black grape is mostly cultivated, there are lands which produce wine approaching that of Ay in delicacy, in the abundance of the saccharine principle, and in the fragrance of the bouquet. Near Epernay is produced the most esteemed white wine of *Pierry*. It is dry, spirituous, and will keep longer than any of the other kinds. To a still class of Epernay wines, put in bottles when about 10 or 11 months old, the French give the name of *tisanne* of *C.* It is a delicious summer drink, much recommended by physicians as aperient and diuretic. The white wines of *C.*, whether still or effervescing, gray or rose, whether solely of black or white grapes, or of both mingled, are generally in perfection the third year of bottling. The best wines, however, gain rather than lose in delicacy for 10 and even 20 years, and are often found good at the age of 30 or 40.

It will not now be amiss to give a cursory view of the mode in which the effervescing wines of *C.* are made. By this means some idea may be formed of the care required in bringing them to a perfection, which has placed them beyond all rivalry. The vine crop is gathered with the greatest care possible. The grapes for the purest wines consist only of those from an approved species of vine. Every grape which has not acquired a perfect maturity, every rotten grape, touched with the frost, or pricked, is rejected. In the gathering, or in the emptying of the baskets, and in the carriage to the press, every motion that can injure the fruit is avoided, as well as the sun's action upon it. On arriving at the press, the baskets, or whatever the grapes are carried upon, are placed in the shade in a cool spot. When the quantity is sufficient for a pressing, they are heaped with as little motion as possible on the press, and the bunches are most carefully arranged. The must is not immediately casked, but is placed in a vat, where it remains for about 10 hours, for the dregs to deposit, and when it begins to ferment is immediately transferred to the cask. Perhaps there are none of the productions of the earth which require more care than the grape, to make it produce the more delicious wines in perfection. In no country is the art of making wine so well understood as in France, and being a commodity which it is impossible to equal except in a soil and temperature of exactly the same character, it is improbable that country will be excelled by any other in this its staple product; — an advantage of no slight moment, when compared with those man-

Fig 68. — Chateau of Sillery.

ufactures which time may enable foreigners to equal, and in many cases to surpass. The following is an account of the process of bottling and the treatment of the wines of *C.*, before they are ready for the market. About Christmas, after the vintage, the fermentation being complete, the wine is racked. This is always done in dry weather, and if possible during frost. A month after it is racked a second time, and fined with isinglass. Before it is bottled it undergoes a third racking, and a second fining. There are some makers of wine who only fine it once after the second racking, and immediately bottle it, taking care that it has been well fined in the cask; others rack it twice, but fine it at each racking. The wine which is designed to effervesce is racked and fined in March and April in the cellar, out of which it is only taken in bottles. After being racked and fined, the produce of the different vineyards is now ready for mixing together. The mixing is usually effected in gigantic vats holding at times as many as 12,000 gallons each, and having fan-shaped appliances, which, on being worked by handles, insure a complete amalgamation of the wine. This process of marrying wine on a gigantic scale is technically known as making the '*cuvée*. Usually four fifths of wine from black grapes are tempered by one fifth of the juice of white ones. The aim is to combine and develop the special qualities of the respective crûs, body and vinosity being secured by the red vintages of Bouzy and Verzenay, softness and roundness by those of Ay and Dizy, and lightness, delicacy, and effervescence by the white growths

of Avize and Cramant. The proportions are never absolute, but vary according to the manufacturer's style of wine and the taste of the countries which form his principal markets. The wine at this period being imperfectly fermented and crude, the reader may imagine the delicacy and discrimination of palate requisite to judge of the flavor, finesse, and bouquet which the *cuvce* is likely eventually to develop. These, however, are not the only matters to be considered. There is, above everything, the effervescence, which depends upon the quantity of carbonic acid gas the wine contains, and this, in turn, upon the amount of its natural saccharine. If the gas be present in excess, there will be a shattering of bottles and a flooding of cellars; and if there be a paucity, the corks will refuse to pop, and the wine to sparkle aright in the glass. Therefore the amount of saccharine in the *cuvce* has to be accurately ascertained by means of a glucometer; and if it fails to reach the required standard, the deficiency is made up by the addition of the purest sugar-candy. If, on the other hand, there be an excess of saccharine, the only thing to be done is to defer the final blending and bottling until the superfluous saccharine matter has been absorbed by fermentation in the cask. The *cuvée* completed, the blended wine is drawn off again into casks for further treatment. This comprises fining with some gelatinous substance, and, as a precaution against ropiness and other maladies, liquid tannin is at the same time frequently added to supply the place of the natural tannin which has departed from the wine with its reddish hue at the epoch of its first fermentation. The operation of bottling the wine next ensues, when the Scriptural advice not to put new wine into old bottles is rigorously followed. For the tremendous pressure of the gas engendered during the subsequent fermentation of the wine is such that the bottle becomes weakened and can never be safely trusted again. It is because of this pressure that the *C.* bottle is one of the strongest made, its weight being about 2 lbs. The wine is emptied from the casks into vats or tuns of varying capacity, whence it flows through pipes into oblong reservoirs, each provided with a row of syphon taps, on to which the bottles are slipped, and from which the wine ceases to flow directly the bottles become filled. The full bottles are conveyed to the corkers, whose guillotine machines are incessantly in motion; next, the *agrafeurs* secure the corks by means of an iron staple, termed an *agrafe*; and then the bottles are conveyed either to a capacious apartment above ground, known as a cellier, or to a cool cellar, according to the number of atmospheres the wine may indicate. It should be explained that air compressed to half its volume acquires twice its ordinary force, and to a quarter of its volume quadruple this force, — hence the phrase of two, four, or more atmospheres. The exact degree of pressure is readily ascertained by means of a manometer, an instrument resembling a pressure gauge, with a hollow screw at the base which is driven through the cork of the bottle. A pressure of 5¾ atmospheres constitutes what is styled a *grand mousseux*, and the wine exhibiting it may be safely conveyed to the coolest subterranean depths, for no doubt need be entertained as to its future effervescent properties. Should the pressure, however, scarcely exceed 4 atmospheres, it is advisable to keep the wine in a cellier above ground that it may more rapidly acquire the requisite sparkling qualities. The bottles are placed in a horizontal position and stacked in rows of varying length and depth, one above the other, to about the height of a man, and with narrow laths between them. Thus they will spend the summer providing all goes well, but in about three weeks' time the process of gas-making inside the bottles is at its height, and may cause an undue number of them to burst. The glucometer notwithstanding, it is impossible to check a certain amount of breakage, especially when a hot season has caused the grapes, and consequently the raw wine, to be sweeter than usual. Moreover, when once *casse* or breakage sets in on a large scale, the temperature of the cellar is raised by the volume of carbonic acid gas let loose, which is not without its effect on the remaining bottles. The only remedy is at once to remove the wine to a lower temperature when this is practicable. In spite of the teachings of science the bursting of *C.* bottles has not still been reduced to a minimum, for whereas in some cellars it averages 7 to 8 per cent, in others it rarely exceeds 2½ or 3. In the month of Oct., the first and severest breakage being over, the newly bottled wine is definitively stacked in the cellars, where the bottles usually remain in a horizontal position for about 18 or 20 months, though some firms, who pride themselves upon shipping perfectly matured wines, leave them thus for double this space of time. By this time the fermentation is over, but in the interval, commencing from a few days after the bottling of the wine, a loose dark-brown sediment has been forming, which has now settled on the lower side of the bottle, and to get rid of which is a delicate and tedious task. The bottles are placed *sur pointe*, as it is termed, — that is to say, slantingly in racks with their necks downwards, the inclination being increased from time to time to one more abrupt. The object of this change in their position is to cause the sediment to leave the side of the bottle where it has gathered; it afterwards becomes necesary to twist and turn it, and coagulate it, as it were, until it forms a kind of muddy ball, and eventually to get it well down into the neck of the bottle, so that it may be finally expelled with a bang when the temporary cork is removed and the proper one adjusted. To accomplish this the bottles are sharply turned in one direction every day for at least a month or six weeks, the time being indefinitely extended until the sediment shows a disposition to settle near the cork. The younger the wine, the longer the period necessary for the bottles to be shaken, new wine often requiring as much as three months. Only a thoroughly practised hand can give the right amount of revolution and the requisite degree of slope. Each bottle is then taken by the bottom, kept carefully in its reversed position, and, the wire and twine being broken, the bottle resting between the workman's knees, the cork is dexterously withdrawn, so as to admit an explosion of the gas, which carries the deposition with it. A temporary cork is then slipped into the bottle, and the wine is ready for the important operation of the *dosage*, upon the nature and amount of which the character of the perfected wine, whether it be dry or sweet, light or strong, very much depends. The dosage varies with the quality of the wine and the country for which it is intended; but the genuine liquor consists of nothing but old wine of the best quality, to which a certain amount of sugar-candy and perhaps a dash of the finest cognac has been added. The saccharine addition varies according to the market for which the wine is destined: thus the high-class English and American buyers demand a dry *C.*, the Russian a wine sweet and strong as "ladies' grog," and the Frenchman and German a sweet light wine. To the extra-dry *C.* a modicum dose is added. In some establishments the dose is administered with a tin can or ladle; but more generally an ingenious machine of pure silver and glass, which regulates the percentage of liqueur to a nicety, is employed. The *dosage* accomplished, the bottle passes to another workman known as the *égaliseur*, who fills it up with pure wine. Should a pink *C.* be required, the wine thus added will be red, although manufacturers of questionable reputation sometimes employ the solution known as *teinte de Fismes.* The *égaliseur* in turn hands the bottle to the corker, who places it under a machine furnished with a pair of claws, which compress the cork to a size sufficiently small to allow it to enter the neck of the bottle, and a suspended weight, which in falling drives it home. These corks, which are principally obtained from Catalonia and Andalusia, cost more than 4 cents each, and are delivered in huge sacks resembling hop-pockets. Before they are used they have been either boiled in wine, soaked in a solution of tartar, or else steamed by the cork merchants, both to prevent their imparting a bad flavor to the wine and to hinder any leakage. They are commonly handed warm to the corker, who dips them into a small vessel of wine before making use of them. The *ficeleur* receives the bottle from the corker, and with a twist of the fingers secures the cork with string, at the same time rounding its hitherto flat top. The *metteur de fil* next affixes the wire with like celerity; and then the final operation is performed by a workman seizing a couple of bottles by the neck and whirling them round his head, as though engaged in the Indian-club exercise, in order to secure a perfect amalgamation of the wine and the liqueur. The final manipulation accomplished, the agitated course of existence through which the wine has been passing of late comes to an end, and the bottles are conveyed to another part of the establishment, where they repose for several days, or even weeks, in order that the mutual action of the wine and the liqueur upon each other may be complete. When the time arrives for despatching them they are confided to feminine hands to have their dainty toilettes made, and are tastefully labelled, and either capsuled or else have their corks and necks imbedded in sealing-wax, or swathed in gold or silver foil, whereby they are ready to be sent away by the maker.

C. of fine quality should never be mixed with ice or iced water; neither should it be iced to extent *C.* ordinary are; for, in the first place, the natural lightness of the wine is such as not to admit of its being diluted without utterly spoiling it, and, in the next, excessive cold destroys alike the fragrant bouquet of the wine and its delicate vinous flavor.

The U. States are, after Russia, England, and the East Indies, the best market for *C.* wine, which is imported generally in baskets or boxes containing 1 doz. quart or 2 doz. pint bottles. *Imp.* duty, in bottles of ½ pint or less each, \$1.50 per doz.; in bottles of over ½ pint, and not over 1 pint each, \$3 per doz.; in bottles of over 1 pint and not over 1 quart each, \$6 per doz.; in bottles of over 1 quart each, \$6 per doz., and \$2 per gallon on excess.

Other sparkling wines produced in France, Germany, and the U. States, and frequently, though improperly, sold as *C.*, are given under the general heading SPARKLING WINES.

The following table gives the imports of *C.* into the port of New York for three successive years.

BRANDS.	1878. *Pkgs.*	1877. *Pkgs.*	1876. *Pkgs.*
Ackerman-Laurance	810	1,546	....
Ayala & Co	1,226	1,332	1,292
Bollinger	3,116	....	....
Bouche Fils & Co	2,696	2,701	3,440
Brunswick	1,512	....	....
Burchard, Delbeck, & Co	2,550	2,599	2,894
Clicquot, Veuve Ponsardin	2,610	2,095	2,590
De St. Marceaux & Co	3,802	3,600	2,751
De Venoge & Co	2,795	....	....
Duc de Montebello	312	245	371
Deutz & Geldermann	825	575	815
Duminy & Co	930	1,762	....
Gilbert, Gustave	....	100	85
Geisler & Co	1,270	1,552	2,202
Gold Lack	430	345	....
Goulet, George, & Co	1,675	3,565	4 575
Heidsieck, Piper	18,690	21,924	17,102
Heidsieck & Co	4,152	4,359	5,031
Heidsieck, Charles	1,950	2,312	2,282
Irroy, E. & Co	415	340	693
Krug & Co	403	1,200	915
Moet & Chandon	5,328	2,950	4,423
Mumm, G. H. & Co	35,906	34,920	34,215
Mumm, Jules, & Co	535	2,801	5,009
Pommery & Greno	5,135	4,820	3,086
Ruinart, Père & Fils	....	1,530	1,882
Roederer, Theophile, & Co	1,080	1,634	....
Sundry Brands	3,495	7,176	5,522
Total	113,678	108,023	101,175

Champignon, the French name for mushroom.

Chancaca, a name in the West Indies for coarse sugar.

Chancelier, Chancellor, the keeper of the records of a consul.

Chancery, the official abode of a consul in a foreign country.

Chandelier, a hanging or fixed lamp with branches, or a frame with branches, to hold candles for lighting a room.

Chandler, an old name for a dealer, as corn-chandler, tallow-chandler, ship-chandler, etc.

Chandler's Shop, a petty huckster's shop; a place where small articles of provisions, etc. are vended.

Change, to barter; to give one kind of money for another, as to change notes for gold; small money given for larger pieces, as change for a dollar; small money. — Also an abbreviated mode of designating an exchange or place where merchants and men of business assemble.

Chankari, an Indian grain measure, about half a pound.

Chanks, the Indian name for the large white massive shells of *Turbinella pyrum*, which are much prized and extensively used in India for the manufacture of bangles or shell-bracelets and anklets, etc. *C.*, cut in segments of circles, form ornaments for the forearms and wrists of women. The chief supply of these shells is from Ceylon; and when the volutes turn to the right, the shell is held in peculiar estimation, and fetches a very high price. When the end is cut off, the shell is used as a kind of sounding-horn.

Channelling-Machine, in boot-making, a machine which cuts the channels in boot-soles to receive the thread and protect it from wear.

Channelling-Tool, a tool for cutting a channel near the edge of a piece of leather, sinking grooves in shoe-soles, etc., so as to facilitate, hide, and protect the sewing.

Channels, Chainwales, strong projecting planks at the sides of a ship, over which the shrouds are spread, to obtain a greater angle.

Channel Steamer, a steamer employed in running across the channels around the British islands or in crossing the channel between England and France.

Chanteur, the French name for a male singer; *chanteuse* being a female vocalist.

Chantier, the French name for a timber-yard or naval dock-yard.

Chantilly Lace, a fine, rich, and costly French hand-made lace, originally made at Chantilly, near Paris.

Chanvre, the French name for hemp.

Chanwan, in India, a small sort of millet.

Chap, the lower and upper parts of the mouth in animals, the jaw; hence, pig's cheeks smoked and dried are vended in England as Bath chaps.

Chape, the back piece or catch by which a buckle is attached to the article or garment; a thin plate at the point of a scabbard.

Chapeau [Fr.], a bonnet or hat. — In maritime commerce, a primage.

Chapelier, the French name for hatter.

Chaplet, a pair of stirrup leathers. — A rosary.

Chapman, a vender or seller on a small scale; a pedler or itinerant dealer.

Charbon, the French name for charcoal and coal.

Charcoal is a form of carbon, the fixed residuum of vegetable or animal matter exposed to a high temperature out of contact with atmospheric air. There are several different varieties of *C.*, the chief of which, however, are animal *C.*, and vegetable or wood *C.*

Animal C. [Fr. *noir animal;* Ger. *Thierkohle*], also called *Animal Black, Bone Black, Ivory Black*, is obtained by burning bone in close vessels. The bones, after being carbonized, are ground in a mill, and the resulting coarse powder, sorted by sieves into two kinds, — one granular, somewhat resembling gunpowder, for decolorizing liquids, and the other quite fine, to be used as a pigment. The first is sold under the name of animal *C.*, the second as bone or ivory black. This crude animal *C.* possesses the valuable property of taking lime and other saline matter from syrups and other aqueous solutions, especially organic ones, at the same time that it decolors them. Its power as a decolorizer may be tested by adding it to a solution of brown sugar or of molasses, or to water containing $\frac{1}{1000}$ part of indigo dissolved in sulphuric acid. The test should be made in a small glass tube. By well washing and carefully reburning it, this *C.* may be used any number of times. As a decolorizer and deodorizer, animal *C.* is vastly superior to vegetable *C.* *Imp.* free.

Vegetable or Wood C. [Fr. *charbon de bois;* Ger. *Holzkohle*], is the residue obtained after heating wood without access of air to about 572° F. It is extremely porous, and retains the structure of the wood from which it is derived. It consists essentially of carbon and of the fixed or inorganic matter which exists in wood; but if carbonization be imperfectly effected, it may contain a sensible amount of hydrogen. *C.* burning is effected in the open air in piles or stacks provided with a yielding cover, in pits, in closed chambers of brick or stone, and in iron retorts heated externally like common gas retorts. The latter method is only practised by the manufacturers of pyroligneous acid and gunpowder. The most perfect *C.* is a very important element in the manuf. of gunpowder. The other uses of *C.* are numerous and varied. It is employed as a fuel in France, Germany, etc., and in metallurgy for tempering metals, making steel, etc.; reduced to powder, it is used to surround

vessels and bodies required to retain their heat for some time; a coating of *C.*, formed on piles and stakes of wood by charring them, promotes their preservation. Fresh burnt *C.*, in coarse powder, restores tainted meat and putrid water, discolors vegetable solutions, deodorizes fetid substances, and withdraws lime from syrups filtered through it. It is also a material for water filters. In medicine, *C.* is principally used as a deodorizer and disinfectant, either in the form of powder or made into a poultice. It is given internally with advantage in various diseases. *C.* forms the best tooth-powder known, as it both whitens the teeth and deodorizes the breath. In all cases, to be useful, the *C.* must be both fresh-burnt and fresh-powdered, and carefully preserved out of contact with the air until about to be administered.

Charcoal Filter, a fountain or other filter for water filled with charcoal.

Charcuterie, the French name for cooked flesh, such as dressed hams, tongues, sausages, cold meats and fowls, etc.

Charge, the quantity of powder which is necessary to fire a ball or bullet from any kind of cannon or fire-arm. — In metallurgy, any quantity of ore put at one time into a furnace to fuse.

Charged, burthened or loaded; trusted or debited for payment.

Chargement [Fr.], the cargo, bulk, or lading of a ship.

Charger, a soldier's horse, trained for duty.

Chargeur [Fr.], a shipper.

Charges. In the custom-house laws of the U. States, this plural term includes all accessory expenses attending the purchase and importation of foreign merchandise, such as packing, transportation to the port of shipping, bill of expenses of the shipping agent, etc. The importer must add them to his invoice, and pay duty thereon.

Chariot, a light coach, of which there are many kinds, as, for travelling, Britzka *C.*, Post *C.*, Dormeuse Post *C.*, Dress *C.*, and *C.* for town use, etc. In France the term generally implies a wagon.

Charkana, an East Indian name for a checked Dacca muslin.

Charkey, Charka, Tscharkey, the hundredth part of the Russian vedro, a liquid measure equal to 0.21 of a pint; 100 vedro are equal to 270½ gallons.

Charleston, a fine city and seaport of the U. States, the cap. of Charleston Co., South Carolina, is situated in 32° 45′ N. lat. and 79° 57′ W. lon. It stands on a flat tongue of land pointing S.E. between the Ashley and Cooper Rivers, which here debouche into a spacious harbor extending about 7 m. S.E. to the Atlantic, with an average width of 2 m. The harbor is surrounded by land on all sides except the entrance, which is about 1 m. wide and 18 feet deep. The water in the harbor, however, is very much deeper, and the work of increasing the depth of the entrance is in progress. Fronting the Atlantic, and extending northwards, is Sullivan's Island, about 6 m. long; and on the other side of the entrance is Morris Island, which stretches to the southward. The city covers an area of about 5 sq. m., and has a water front of about 9 m. *C.* is one of the leading commercial cities of the South, being the outlet of a very rich rice and cotton producing country, and a point of supply for an extensive territory, embracing S. Carolina, and parts of N. Carolina, Georgia, Alabama, Florida, Tennessee, and Mississippi. The commerce consists chiefly of exports. During the year 1878, the foreign commerce comprised exports to the value of $17,727,783, and imports valued at $134,564. Included in the exports there were 135,130,071 lbs. of cotton, valued at $15,794,887. Besides this foreign commerce, there is an extensive trade in cotton, rice, naval stores, phosphate, and lumber, which are shipped in large quantities to ports of the U. States. In 1878, 278 vessels, of 126,746 tons, entered in the foreign trade, and 296, of 139,474 tons, cleared; 396 vessels, of 321,705 tons, entered, and 294, of 202,883 tons, cleared in the coastwise trade. The number of vessels belonging to the port was 186; tonnage, 11,127. The manuf. of *C.* are of inferior importance compared with its commerce. Among the most important industries are the manuf. of fertilizers from the phosphate obtained in the vicinity of the city, where the richest deposits of this material in the U. States have been discovered. *C.* has an extensive wholesale trade in dry goods, boots and shoes, clothing, hats and caps, drugs and medicines, etc. The city has 3 national, 4 state, and 5 savings banks. Three railroads have their termini here, — the Northeastern, extending to Florence; the South Carolina, to Augusta, Ga.; and the Savannah & *C.* The Santee Canal, 22 m. long, connects *C.* with the Santee River. The city has an excellent fire department and an efficient police system. Pop., 48,956.

Charlotte, Columbia, and Augusta R.R. Co., from Charlotte, N. C., to Augusta, Ga., 195 m. This Co., whose offices are in Columbia, S. C., was formed in 1869 by the consolidation of the Charlotte & South Carolina and the Columbia & Augusta R.Rs. *Financial Statement:* Capital stock ($13,220.59 per m.), $2,578,000; funded debt ($12,820.57 per m.), $2,500,000; floating debt, $132,775.95; profit and loss, $192,880.16. Funded debt in detail: 1st consol. mortgage, issued 1869, $1,806,500, payable 1895, interest 7% (Jan. and July); 1st (Col. & Aug.) mortgage, issued 1869, $183,500, payable 1890, interest 7% (Jan. and July); 1st (Chas. & S. C.) mortgage, issued 1860, $10,000, payable 1888, interest 7% (Jan. and July); 2d consol. mortgage, issued 1876, $500,000, payable 1910, interest 7% (Jan. and July). Net earnings, 1878, $168,578.19.

Charms, amulets, fancy ornaments, and articles of various kinds sold to wear, from an imaginary belief that they ward off evil.

Charnley Forest Stone, a description of whetstone or hone obtained from Leicestershire, England.

Charpoys, small portable stretcher beds, used in India, consisting of a wooden frame resting on four legs, with tape across to support the bedding.

Charred Wood is wood of which the surface has been carbonized, to prevent its decay from exposure to air and moisture. Stakes and piles are generally thus treated before they are driven into the ground. Casks are charred on the inside by coopers when they are intended to hold water. In both these cases the fire is commonly applied directly to the wood. A new method has, however, been employed with apparent success. This consists in washing the wood with the strongest oil of vitriol. In this way, not only the outer surface, but the surface of all the cracks and holes, get carbonized, which is not the case when heat is employed. It succeeds well with musty casks and vats.

Chart, a hydrographic map for the use of navigators, being a projection of some part of the sea or coast on a plane surface. *C.*, as well as ordinary maps, may be constructed on any of the

principles by which a spherical surface is represented on a plane. Mercator's Projection, however, is the one most generally used.

Charter, a writing conferring or bestowing powers, rights, or privileges. See CORPORATION. — The letting or hiring of a vessel for a certain purpose, and by special contract, as a ship is advertised for *charter*.

Chartered, said of a ship hired for a voyage.

Charterer, one who engages a ship and causes it to be laden wholly with his own goods, or partly with merchandise or produce belonging to others.

Chartermaster, in the mining districts, one who raises coal or iron-stone by the ton, at a contract price.

Charter-Party is a contract in writing by which an entire ship, or some principal part thereof, is let to a merchant for the conveyance of goods, on a determined voyage to one or more places. This contract, which is a branch of the contract of affreightment, generally contains specifications of the ship and her burden, the amount of freight, the limitation of the agreement, by time or voyage, and the time of loading and unloading. The amount of demurrage is generally fixed. The most important questions regarding charter-parties generally relate to the risks and responsibilities of parties arising out of the usual perils of the sea, compensation or damage for delays, alterations of the agreement, etc. Information on these subjects will be found under the heads AFFREIGHTMENT, BILL OF LADING, DEMURRAGE, and SHIPPING.

Chart-Maker, an artist who draws or engraves charts on metal plates.

Chartometer, an instrument adapted for the admeasurement of charts or maps.

Chartreuse, a celebrated and highly tonic French liqueur, manufactured by the Carthusian monks of the Grande Chartreuse, a monastery situated near Grenoble, among lofty mountains, at an elevation of 9,483 feet above sea-level. This liqueur, into the composition of which enter many herbs, has never been successfully compounded elsewhere. Every bottle of the genuine cordial bears the signature of Father Garnier, a superscription which is constantly imitated by fraudulent manufacturers.

Charvolant, a carriage drawn by kites.

Charwoman, a woman who goes out to work by the day or job.

Chase, to hunt or pursue game. — An iron frame to fasten forms of type in, to print from; chases are made of either cast or malleable iron.

Chaser, a tool for cutting threads in the hand-lathe.

Chasing, or **Enchasing**, the art of embossing or making bassi-rilievi in metals. The work is punched out from the back, and then cut on steel blocks or puncheons, and cleared with small chisels and gravers. Much C. is done by filling the vessel to be chased with a composition of pitch, and then hammering with a point and chisel on the outside.

Chasse-Marée, a French shallop or coasting vessel.

Chassepot. See GUN.

Chateau-Haut-Brion, C.-Lafitte, C.-Latour, C.-Margaux. See CLARET WINES.

Chatelaine, a steel chain worn at a lady's waist-belt, on which to suspend keys, scissors, and fancy ornaments.

Chatham. See GREAT BRITAIN.

Chatoyant [Fr.], a term applied to minerals, as the precious opal, which, when turned, successively exhibit different prismatic colors.

Chattah, an umbrella-hat, or sun-screen, made in the East of the leaves of the *Licuala peltata* palm, and also of a dried talipot or plantain leaf. These C. hats are much worn by the ploughmen, cow-keepers, and coolies of Bengal, Assam, etc.

Chattel, a legal term comprehending all articles of goods, movable or immovable, except such as have the nature of freehold.

Chauli, or **Chawali**, a small silver coin in the Mahratta country, worth about 2 annas, or 6 cents.

Chautia, a common grain measure in the north-west provinces of India, about equal to a seer or 2 lbs.; 5 C. make a pansiri.

Chawl, a weight for precious metals in Malwa, about the fourth of a grain. — Also a vernacular name for rice in India.

Chay, or **Chaya**, a red dye-stuff obtained in India from the root of *Hedyotis umbellata*, and used there by dyers for the same purpose as madder.

Cheap, to be had at a low price; at a low price or rate; being a good bargain; bearing a low price, as, a *cheap* article of sale.

Cheapen, to beat down, depreciate, or lower in price.

Cheap-Jack, the common name in England for a travelling hawker or a stationary vender of refuse or cheap articles.

Cheat, to practise extortion and fraud; to impose upon; to effect or obtain by trick, artifice, or low cunning. — Anything false or defrauding.

Chebacco, or **Pinkstern**, a kind of sailing-craft, employed in the Newfoundland fisheries.

Check, or **Cheque**, a written order on a banker by a person having money in the banker's hands, directing him to pay on presentment, or to bearer, or to a person named, a certain sum of money. C. partake of the nature of bills of exchange, in their indorsability, as the representative of cash. The chief differences between a C. and a bill of exchange are: 1. that a C. is not due until presented, and, consequently, can be negotiated any time before presentment, and yet not subject the holder to any equities existing between the previous parties; 2. that the drawer of a C. is *not* discharged for want of immediate presentment with due diligence, while the drawer of a bill of exchange *is;* 3. that the death of the drawer of a C. rescinds the authority of the banker to pay it; while the death of the drawer of a bill of exchange does not alter the relation of the parties. — A check ought to be drawn within the State where the bank is situated, because if not so drawn it becomes a foreign bill of exchange, subject to mercantile law; requiring that it be protested, and that due diligence be used in presenting it, in order to hold the drawer and indorsers. If a bank pay a forged check, it cannot be charged to the depositor whose name was forged; but a bank can, if the demand of return is immediately made, recover the money from a person who innocently presented a forged check and was paid. — A check, being payable on demand, is not to be accepted. There is a practice, however, of making C. *good*, by the banker, which fixes his responsibility to pay that particular C. when presented, and amounts, in fact, to an acceptance. Such a marking is called *certifying*, and a check so marked is called a *certified C.* A certified C. is immediately charged to the account of the drawer, although it may not be presented for payment till several days or weeks later. Sometimes a C. is *crossed*, that is, made payable only through a banking firm, instead of on de-

mand by presentation at the counter. — A two-cent revenue stamp must be affixed on every bank *C.*

Check-Book, a printed book of blank forms, for writing orders or drafts on a banker, for money lodged to his credit by the drawer.

Checker-Work, any kind of work in which crossed or angular patterns occur.

Check-Rail, a contrivance used on a double line of railroad, at the crossing from one line of rails to another, or at a siding-place, to allow the trains of cars to run on, or to move into the other line or siding, as it may be adjusted.

Checkrum, an East Indian money equal to 1½ rupees, or about 73 cents.

Checks are fancy cambric muslins with stripes and cords placed checkerwise, by thick threads being introduced into the warp or weft. Also a trousers material, a cross-barred fabric, chiefly black and white worsted and cotton, but some is made all of cotton. — A kind of Venetian blind used as screens or sun-shades in India.

Cheddar. See CHEESE.

Cheeks, those pieces of a machine, or other implement or instrument, which form corresponding sides, or which are double and alike; as, the *cheeks* of a windlass. — The shears or bed of a lathe as made with two pieces for conducting the puppets. — Two upright equal and similar parts of any piece of timber-work, as the sides of a dormer-window. — *Cheeks of a mortise* are the two solid parts upon the sides of the mortise. The thickness of each cheek should not be less than the thickness of the mortise, unless mouldings on the stiles require it to be otherwise. — *Cheeks of a mast or block*, the projection on each side of a mast, upon which the trestle-trees rest; the sides of the sheet of a block.

Cheese [Du. *Kaas;* Fr. *fromage:* Ger. *Käse;* It. *fromaggio, cacio;* Port. *queijo;* Sp. *queso*], the curd of milk, salted, dried, and compressed into a solid mass. There are *C.* of many different varieties and qualities, the principal distinctions arising from differences in the composition and condition of the milk operated upon, from variations in the method of preparation and curing, and from the use of the milk of other animals besides the cow, as, for example, the goat and the ewe, from the milk of both of which *C.* is manufactured on a commercial scale. The quality and the composition of the milk operated on are of prime importance in *C.*-making. Not only does this substance vary widely in richness and flavor owing to the breed, the nature of the food, and state of the health of the animal yielding it, and many other circumstances; but in *C.*-making the differences are still further increased, in some cases by adding cream to it, and in others by using it as skim-milk or milk deprived of a portion of its fat. The essential constituents of milk are the nitrogenous substance called *caseine*, and butter. The object of the *C.*-maker is to obtain in a solid form as large a proportion as possible of the caseine and butter contained in the milk dealt with. The poverty in these constituents of the whey or liquid matter separated in the process of making *C.* is therefore, to some extent, a measure of the success of the operation. Milk, as is well known, if allowed to stand for some time, becomes thick, and is then separable into two portions, — a solid white curd, and a greenish liquid whey. Such a coagulation and separation is essential in the making of *C.* Acid substances readily curdle *C.*, and hydrochloric acid, vinegar, and cream of tartar have been employed to produce coagulation for *C.*-making. The curdling is also, in practice, produced by the action of such substances as the juice of figs, the butter-wort, and other plants. But the substance used in all great *C.*-producing districts is *rennet*, a preparation of the fourth or digesting stomach of the suckling calf. Rennet is prepared by cutting up the membrane in strips, salting, smoking, and sometimes treating it with spices and aromatics. In order to hasten the coagulating action of rennet, and to produce a curd of sufficient hardness, it is found necessary to heat the milk to a temperature ranging from 72° to 90° F. The lower temperature, it is found, yields a soft *C.*, retaining much whey and ripening soon; while the increased heat produces a firm curd and a solid slow-ripening *C.* After due coagulation the curd is broken, and by a variety of manipulative processes as much as possible of the whey is drained away, and the curd is reduced to comparatively dry crumbly fragments. At this stage, sometimes, but not frequently, the curd is salted; it is then collected into a clean *C.*-cloth, placed in a *C.* vat of the form and size of the *C* to be made, and submitted to pressure in the *C.* press. While in the press it is frequently turned, a good deal of whey meantime continuing to exude; and it is found that the amount of pressure has much influence on the solidity and rate of ripening of the *C.* As soon as a sufficient skin has formed on the *C.* to preserve its shape, it is removed from the press and salted by repeated rubbings of salt over its surface. The *C.* is then put aside in a clean, cool, airy situation for ripening, a process which takes a variable period according to the quality of the *C.*, its method of preparation, and other circumstances. The ripening of *C.* is the result of a slow process of decay caused by a spontaneous fermentative action. In hard, solid, poor *C* it acts very slowly, while in those which contain butter in large proportions its action is very energetic, and they cannot be preserved for any considerable period. *C.* when newly made has an acid reaction, but by degrees from without inwards the acid reaction becomes less apparent, and the *C.* ripens. A portion of the caseine suffers decomposition, evolving ammonia and ammoniacal bases which neutralize the acid of the *C* In a similar way the fat is partly decomposed, and the resulting fatty acids also combine with the ammonia evolved by the caseine. When this action is allowed to proceed too far, the *C.* becomes alkaline, putrefactive decay ensues, free ammonia is evolved, an offensive odor is produced, and sometimes even poisonous compounds are formed. A satisfactory indication of ripening found in Stilton and other rich *C.* is the appearance of a green mould, streaked throughout the mass, produced by the fungus *Aspergillus glaucus.* A red mould also develops from *Sporendonema casei*, and when the ripening becomes advanced the *C.*-mite, *Acarus domesticus*, is produced with great rapidity, in inconceivable numbers. — The storing of the newly made *C.* is an important point for the maker and the wholesale dealer. A cool cellar, neither damp nor dry, and which is uninfluenced by change of weather or season, is commonly regarded as the best for the purpose. If possible, the temperature should on no account be permitted to exceed 50° or 52° F. at any portion of the year. — As an article of food *C.* is used in a double capacity. Rich *C.* in an advanced stage of ripeness is eaten in small quantities, partly on account of its piquancy, and partly also as a digestive stimulant. Skim-milk *C.*, and all the varieties poor in fat, again, are valuable articles of food on account of their high percentage of nitrogenous matter, and the cheaper quali-

ties are, on this account, extensively consumed among the classes by whom other animal food is not usually obtainable. As an article of ordinary diet, *C.* labors under the disadvantage of being hard of digestion; and especially when it is toasted, as is frequently the practice, it really is, as has been observed, "about as digestible as leather."

In America and England the milk of cows only is used in the manuf. of *C.* Excluding the so-called cream *C.*, — a preparation of a soft, buttery consistence, made from cream gently pressed, which must be used new and fresh, — English *C.* may be divided into three classes: 1st, that made with whole milk plus cream; 2d, that made with whole milk; and 3d, that made with milk minus cream, or skim-milk. Stilton and Double Gloucester belong to the first class, being made of morning milk to which the cream of the previous evening's milking is added. Whole milk *C.* are represented by Single Gloucester, Cheshire, Cheddar, and Dunlop; and the ordinary country *C.* used by the laboring classes represents the third class. Almost all the English *C.* are very extensively and successfully made in the U. States, where *C.* has become an article of commerce of great importance. Most of the American *C.* is made at factories, which are carried on by associations of farmers, who employ a manager; the usual practice being to send the milk to the factory every night and morning, keeping it as cool as possible during transportation. The number of cows supplying one factory ranges from 100 to more than 1,000, the average being about 400. The State of New York produces more than half of the *C.* made in the U. States. The other principal States producing *C.* are Ohio, Illinois, Vermont, Massachusetts, New Jersey, California, etc. The following table of exports of C. from the U. States for 20 years shows the steady increase of this important branch of commerce.

	Pounds	Dollars.		Pounds.	Dollars
1859...	7,103,323	649,302	1869 ..	39,960,367	6,437,866
1860...	15,515,799	1,565,630	1870...	57,296,327	8,881,934
1861...	32,361,428	3,321,631	1871 ..	63,698,867	8,752,960
1862..	34,052,678	2,715,892	1872...	66,204,025	7,752,918
1863...	42,045,054	4,216,804	1873...	80,366,540	10,498,010
1864...	47,751,329	5,638,007	1874...	90,611,077	11,898,995
1865...	53,089,468	11,684,927	1875...	101,010,853	13,659,603
1866...	36,411,985	6,030,828	1876...	97,676,264	12,270,083
1867...	52,352,127	7,893,535	1877...	107,364,666	12,729,615
1868...	51,097,203	7,010,424	1878...	123,783,736	14,103,529

On the exports of *C.* in 1878, 120,920,600 lbs., valued at $13,759,385, went to England; and 1,593,426 lbs., valued at $172,170, to Canada. During the same year the U. States imported *C.* from France, Germany, Holland, and Italy, to the value of about $450,000. *Imp.* duty, 4 cts. per lb., grated, 4 cts. per lb.; if in glass bottles, the same are dutiable as such.

The varieties of *C* met with in commerce are very numerous and differ greatly from each other in richness, color, and flavor. These are commonly distinguished by names indicative of the places in which they have been manufactured, or of the quality of the materials from which they have been prepared. The following are the principal varieties met with in Europe, many others being mentioned under their particular names. —

Brickbat C., so called from its form, made in Wiltshire, England, of new milk and cream.

Brie C., a very excellent French *C.*, made of the purest cream. It was formerly imported, but is now made in perfection in the State of New Jersey.

Cheddar C., a fine, spongy kind of *C.*, the eyes or vesicles of which contain a rich oil; made up into round, thick *C.*, of considerable size (150 to 200 lbs.).

Cheshire C. is made from new milk, without skimming, the morning's milk being mixed with that of the preceding evening, previously warmed, so that the whole may be brought to the heat of new milk. To this the rennet is added, in less quantity than is commonly used for other kinds of *C.* On this point much of the flavor and mildness of the *C.* is said to depend. It is made in large, round, thick *C.* (100 to 200 lbs. each). It is generally solid, homogeneous, dry, and friable rather than viscid.

Cottenham C., a rich kind of English *C.*, in flavor and consistence not unlike Stilton, from which, however, it differs in shape, being flatter and broader than the latter.

Derbyshire C., a small, rich variety, very similar to Dunlop *C.*

Dunlop C., a rich, white, and buttery English *C.*, in round forms, weighing from 30 to 60 lbs.

Dutch C., made in Holland. It is of a globular form, and weighs from 5 to 14 lbs. Those from Edam are very highly salted; those from Gouda less so.

Gloucester C. The Single Gloucester is made from milk deprived of part of its cream: Double Gloucester, from milk retaining the whole of the cream. Mild tasted, semi-buttery consistence, without being friable; in large, round, flattish forms.

Gruyère C., a fine description of *C.*, chiefly made in the Canton of Fribourg, Switzerland, and known in this country as *Schweitzerkase*. It is firm and dry, and exhibits numerous cells of considerable magnitude. It is made in the States of New York and Ohio; but it is said that the American Gruyere lacks the flavor of the Swiss, because of the difference of the grass upon which the cattle feed.

Limbourg C., made at Limbourg, Belgium, is eaten while in a high state of putrefaction. Large quantities of this *C.* are made in New York, Ohio, Illinois, and Wisconsin, but Oneida, Lewis, and Jefferson Counties are the principal seats of its manufacture.

Lincoln C., an English *C.*, made from new milk and cream, in pieces about 2 inches thick. It is soft, and will not keep over 2 or 3 months.

Neufchatel C., a French *C.*, made in Normandy, of pure cream, thickened by heat and compressed in a mould. It is esteemed as a great delicacy, but, from the difficulty of preserving its good qualities, can be scarcely appreciated out of France. It is now largely, but not very successfully, made in the State of New Jersey.

Norfolk C., an English *C.*, dyed yellow with annotto or saffron, good, but not superior: in cheeses of 30 to 50 lbs.

Parmesan C., an Italian *C.*, made at Parma, etc., from the curd of skimmed milk, hardened by a gentle heat. About a fortnight after making, the outer crust is cut off, and the new surface varnished with linseed oil, and one side colored red. It is used, grated, as an ingredient in soups and macaroni.

Roquefort C., the best French *C.*, made from ewe's milk, greatly resembles Stilton, but possesses a peculiar pungency and flavor. The quality of this very excellent *C.* depends exclusively upon the places where the *C.* are kept after pressing, and during maturation. Those are cellars, communicating with mountain grottoes and caverns, which are kept constantly cool, at about 41° to 42° F., by currents of air from clefts in the mountains. The value of these cellars as storehouses varies with their property of maintaining an equable and low temperature.

Schabzigerkase is made in the Canton of Glarus, Switzerland, of curd which has been fermented. It is mixed with the pulverized flowers of *Melilotus cœruleus*, and pressed in a mould. It is usually eaten grated, spread upon buttered bread, and has a sharp and peculiar flavor much relished by many.

Stilton C., the richest and finest of the English *C.*, is made from raw milk, to which cream taken from other milk is added; in cheeses generally twice as high as they are broad. Like wine, this *C.* is vastly improved by age, and is therefore seldom eaten before it is 2 years old. A spurious appearance of age is sometimes given to it by placing it in a warm, damp cellar, or by surrounding it with masses of fermenting straw or dung.

Suffolk C., an English *C.*, from skimmed milk; in round, flat forms, from 2 to 30 lbs. each. Very hard and horny.

Swiss C. See GRUYÈRE and SCHABZIGERKÄSE, above.

Westphalian C. is a German *C.*, in small balls or rolls of about 1 lb. each. It derives its peculiar flavor from the curd being allowed to become partially putrid before being pressed. In small balls or rolls of about 1 lb. each.

Cheese-Coloring. See ANNOTTO.

Cheese-Dairy, a cool room where cheese is made.

Cheese-Factor, Cheese-Monger, a dealer in cheese, a provision merchant.

Cheese-Knife, a wooden spatula made use of in dairies to break down the curd whilst in the cheese-tub.

Cheese-Lep, a bag in which rennet is kept for making cheese.

Cheese-Press, a screw press employed in cheese-dairies to force the whey from the curd in the cheese-vat.

Cheese-Rennet, a wild-flower, the yellow bed-straw (*Galium verum*), sometimes used for curdling milk to make cheese.

Cheese-Scoop, **Cheese-Taster**, an auger instrument for boring and tasting cheese.

Cheese-Toaster, an instrument hung at the bars of a grate to toast cheese.

Cheese-Vat, the case in which the curd is placed to be pressed in cheese making.

Cheh, the tenth part of the Chinese tael.

Cheki, a jeweller's weight in Persia, of 7,200 grains.

Chekmak, a fabric of silk and gold thread, mixed with cotton, made in Turkey.

Chemic, a commercial name for bleaching powder.

Fig. 69. — Chestnut-Tree.

Chemical Balance, a very accurate balance for assays, and other nice operations.

Chemical Paper, paper prepared for chemical operations, as filtering paper, paper for photographs, etc.

Chemicals, a commercial term for all substances used in medicine, the arts, and manufactures, which are produced by chemical processes.

Chemical Stopperer, a manufacturer of stoppers for glass bottles.

Chemicking, in bleaching, a process which precedes the *souring*, and which consists in steeping goods in a dilute solution of chloride of lime in stone vats, the liquid being continuously pumped up and straining through the goods until the action is complete.

Chemise, a French name for the lining of a furnace. — A female inner garment.

Chemisette, a lady's lace or net stomacher.

Chemist, a scientific manufacturer of substances used in chemistry; also, a drug-seller. Sometimes the business of operative and retail *C.* is combined.

Chemistry, the study of the various elementary bodies of nature, their affinity, properties, laws, and combinations, and their useful applications to the arts and manufactures.

Chemitype, a name under which have been introduced several processes by which a drawing or impression from an engraved plate is obtained in relief, so as to be printed on an ordinary printing-press.

Chemnitz, a town of Germany, in Saxony, 37 m. W. S.W. of Dresden, is one of the principal manufacturing places of Germany, and is celebrated for its manuf. of hosiery and other woollen and cotton goods. Pop. 78,209.

Chendi, an Eastern name for the fermented juice of the date palm.

Chêne, the French name for an oak.

Chenevis, a name for hemp-seed in France.

Chenille [Fr.], a silk or worsted cord woven in tufts, and used as a trimming for ladies' dresses.

Chenille Carpet, a soft and beautiful, but costly carpet. It is made by stretching out horizontally the warp-threads, while the weft is thrown in by a shuttle. The weft consists of chenille, and when the weaving is completed, the loose, colored threads of the chenille are combed up and made to appear at the surface, where they are cut and sheared to a state of velvety softness. The pattern is dyed in the chenille itself, nothing appearing at the surface of the carpet except the ends of the chenille fringe.

Cheoh, a long measure in Sumatra = 14½ inches.

Cheque. See Check.

Chequee, a small Turkish weight. The *C.* used in weighing gold, silver, and precious stones contains 100 dirhems or drams, and is equal to 4,950 troy grains; but the *C.* for goat-wool contains 800 drams, and that for opium 250 drams.

Cheramella, a vernacular Indian name for the subacid fruit of the *Cicca disticha*, universally used as an article of food, raw or cooked, or in pickles or preserves.

Cherang, a lac varnish used in Cambodia for lackering cabinets, cases, etc.

Cherbourg. See France.

Cherimoya, an esteemed fruit of Peru and Brazil, the produce of *Anona cherimolia*.

Cheroot, a species of cigar imported from Manilla, in the Philippine Islands, distinguished by extreme simplicity of construction as well as delicacy of flavor. The cigars now commonly sold as *C.* are, for the most part, made of inferior tobacco, and are often much adulterated articles.

Cherray, a commercial weight of Persia, 78.85 of which are equal to 100 lbs. avoirdupois.

Cherry [Fr. *cerise;* Ger. *Kirsche;* It. *ciriegia;* Port. *cereja, jinja;* Sp. *cereza*], the well-known fruit of the *Prunus cerasus*, of which there are now several hundred cultivated varieties. The wood of the tree is close, and takes a fine polish; it is worked up into common chairs and other articles,

being stained to imitate mahogany, and is also used for musical instruments. The wood of the Black Cherry-tree of N. America, *Cerasus serotina*, is hard, handsome, and durable, resembling mahogany.

Cherry-brandy is a sweetened or cordial spirit in which cherries are steeped. — *Cherry-wine* is a sweet wine made from cherries.— The *Maraschino* of Zara is prepared from a particular species of *C.* cultivated in Dalmatia. — *Kirschwasser* is the fermented liquor of a small black *C.*

Cherry-Coffee, the planters' name for the fruit of the coffee as picked from the tree, before it has undergone the operations of pulping, drying, etc., to prepare the berry for shipment.

Cherry-Laurel. See LAUREL.

Chert-Stone, a variety of horn-stone, quarried in Derbyshire for making the stones of pottery mills to pulverize flints.

Chertwert. See CHETVERT.

Chervice, a fine kind of tallow shipped to Constantinople from the Black Sea ports, and used for culinary purposes.

Chervil [Fr. *cerfeuil*], a common pot-herb with edible roots, the *Anthriscus cerefolium.* The young leaves are much used in France as an ingredient in salads.

Chesapeake & Ohio R.R., from Richmond, Va., to Huntingdon, W.V., 427.79 m.; branches, 6.81 m.; total, 434.60 m. This Co., located in Richmond, is a consolidation of the Virginia Central and the Covington & Ohio R.Rs. In 1873 the Co. made default in payment of their Nov. coupons, and a receiver was appointed in 1875. The road was sold under foreclosure in 1878 for $2,750,000, and reorganized. *Cap. stock*, $15,000,000. *Funded debt:* First preferred 7% stock, $1,500,000; Second preferred 6% stock, $8,500,000; Virginia Central R.R. bonds and interest, $2,000,000; 1st mortgage 30 yrs. 6% bonds A, $2,000,000, debts B, $15,000,000; 2d mortgage 40 yrs. 6% bonds, $10,000,000. Total stock and bonds, $54,000,000.

Cheshire-Cheese. See CHEESE.

Cheshire R.R., from South Burnham, Massachusetts, to Bellows Falls, New Hampshire, 53.62 m. This Co., whose offices are in Keene, N. H., was chartered in 1844. *Capital stock and funded debt:* 21,000 preferred shares, $2,100,000; 533 original shares representing $53,300; outstanding bonds of various issues, $833,500; total, $2,986,800. Net earnings for 1878, $77,492.22; surplus for the year, after payment of interest on stock and bonds, $23,033.42.

Chess-Board, a board with sixty-four checkers or squares of alternate light and dark colors, for playing the game of chess on.

Cheasel, the perforated wooden mould or vat in which cheese is pressed.

Chess-Table, a small fancy table with inlaid squares on the top for playing the game of chess on.

Chess-Trees, are pieces of wood bolted to the sides of a ship to secure the clews of the mainsail.

Chest, a wooden box or package of no certain dimensions. The chest of opium weighs 141¼ lbs., the tare allowance for leaf and dust being 1¼ lbs. A chest of tea varies: the chest of Pekoe contains but seven catties, of souchong and pouchong 25, and of hyson 60. The chest of sugar from Brazil is about 13 cwt.; of indigo from Bengal, about 200 lbs. The chest of olive oil contains 60 flasks, or a little over two gallons.

Chester. See GREAT BRITAIN.

Chestnut [Fr. *chataigne;* Ger. *Kastanie;* It. *castagna;* Port. *castanha;* Sp. *castaña*] is a dark-brown, ovate, sharp-pointed nut, or fruit, containing a nutritive starchy kernel, of a sweet flavor, which is extensively used as food, boiled, roasted, ground, or otherwise prepared, in Italy, Spain, and the S. of France, where the tree, *Castanea vesca* (Fig. 69) chiefly abounds. The American variety, abundantly found in the mountainous parts of the Eastern States, from New York to Georgia, has smaller but sweeter nuts than those of the European or Spanish *C.* The American *C.* are sold by the bushel; the Spanish *C.* are imported in casks of about 125 lbs., and are sold by the pound. The *C.*-tree in a wild state sometimes attains an extraordinary size. The timber, which is coarse-grained, strong, elastic, light, and very durable, is used for posts and rails, and also for cabinet-ware. See HORSE-CHESTNUT.

Chest of Drawers, a set of drawers for keeping clothes or other articles in, made of mahogany, deal, or other wood.

Chest-Protector, a hare-skin or any covering for the chest worn by persons suffering from pulmonary complaints.

Chest-upon-Chest, a double set of drawers that divides in the middle for the convenience of moving or travelling.

Chetvert, or **Tchetvert**, a Russian dry measure = 5.77 bushels.

Cheval, the French name for a horse.

Cheval-Glass, a lady's dressing-room looking-glass, in which the full-length figure may be seen.

Chevalier Barley, an esteemed kind of malting barley, named after the person who first brought it into notice.

Cheveril, leather prepared from kid-skin.

Cheviot Wool, the wool of a peculiar and valuable breed of sheep of Scotland, used in the manuf. of Scotch shawls, tweeds, etc.

Chevrette, an engine for raising pieces of artillery into their carriages.

Chewing-Ball, a medicinal bolus for a horse.

Chewing-Tobacco. See TOBACCO.

Chew-Stick, the branches and twigs of the *Gouania Domingensis*, which are used in the West Indies for cleaning the teeth, and also powdered as a dentifrice.

Chhap, or **Chop**, in India, an official mark on weights and measures, to indicate their accuracy; also, an Eastern custom-house stamp or seal on goods that have been examined and have paid duty.

Chian Turpentine, a resinous juice obtained in small quantities from the *Pistacia terebinthus*, used medicinally, and employed in the East as a masticatory to sweeten the breath and preserve the teeth.

Chiavari. See ITALY.

Chibouk, a Turkish pipe, usually with an ebony or cherry-wood stem, and an amber mouthpiece, the bowl being of baked clay.

Chica, a fermented intoxicating beverage made in South America, usually from maize steeped in warm water; that most prized is, however, first chewed and then mashed in hot water; sometimes it is made from other vegetable substances. — Also, the red coloring-matter deposited by a decoction of the leaves of *Bignonia chica* in cooling. It is used by some of the North American Indian tribes to stain their skins.

Chicago, a city and port of entry of the State to Illinois, in Cook Co., and one of the most important cities of the U. States. It is situated on the W. shore of Lake Michigan, 960 m. by rail from New York; lat. 41° 50′ 1″ N., lon. 87° 34′ 8″ W. The city is at an elevation of nearly 600 feet

above sea-level, but only 14 feet above the lake. There is an inlet called the Chicago River which runs from the lake nearly a mile west, then separates into two branches, one running N. W., the other S. W., thus dividing the city into 3 divisions, connected by more than 35 bridges, and by two tunnels running under the bed of the river. This river ("Chacagua," Indian for thunder, and so called after the Indian Thor, or thunder god) gave the city its name. Originally it emptied into the lake, but a remarkable piece of engineering caused it to change its course, and, so to speak, run "up-hill." The Illinois and Michigan Canal, with which the main branch of the river is connected, was so deepened as to draw the water out from the lake; the canal empties into the Illinois River, and the Illinois River into the Mississippi River, so that the water of Lake Michigan flows into the Gulf of Mexico. The river has been so deepened that the largest vessels may be towed into any of its branches, which are supplied with docks and water-slips, affording a dockage capacity of nearly 40 m., more than 20 of which are already in use.

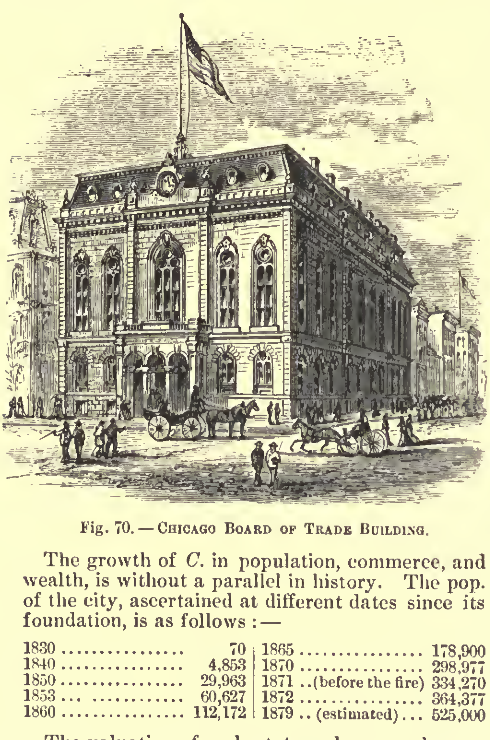


Fig. 70. — Chicago Board of Trade Building.

The growth of *C.* in population, commerce, and wealth, is without a parallel in history. The pop. of the city, ascertained at different dates since its foundation, is as follows: —

1830	70	1865	178,900
1840	4,853	1870	298,977
1850	29,963	1871 ..(before the fire)	334,270
1853	60,627	1872	364,377
1860	112,172	1879 .. (estimated)	525,000

The valuation of real estate and personal property for purposes of taxation (rated at about one half the actual value), from $37,053,512 in 1860, had reached $131,981,436 in 1878. The financial affairs of the city are in a very favorable position. The floating debt, which amounted to about $4,000,000 in 1875, has been since almost entirely extinguished, and the bonded debt was reduced in 1878 to $13,057,000, and this under an abatement of over $1,500,000 in annual city taxes. Municipal taxation, although there, as almost everywhere, more or less a subject of complaint, is in fact considerably less than one per cent on a fair cash valuation of the taxable property of the city. The great conflagration of October 8 and 9, 1871, which destroyed almost all the business part of *C.*, illustrated the indomitable energy of the population. The work of rebuilding the city was begun before the cinders were cold, and within three years *C.* was provided with buildings equal in capacity, and of twofold the value of those that had been destroyed. The "fire limits" were extended so as to exclude the erection of other than stone, brick, or iron buildings within a large area, and subsequently this prohibition was applied to the entire city. The result has been to make New *C.* the most beautiful city of A. in its business centres. The business and population continued to increase in spite of the disaster; indeed, the ratio of growth became larger. The solidity and permanence of this prosperity were confirmed during the panic of 1873, when the *C.* banks alone, among those of all large cities, were not compelled to issue certificates of deposit, but continued steadily to pay out current funds. There were few mercantile failures, and the business of the year following the panic still showed an increase. This superior resistance to the general contraction is attributed to the marvellous development of the great Northwest, especially such portions of it as may be said to be commercially tributary to *C.* There are in *C.* 20 grain elevators, with an aggregate storage capacity of 15,155,000 bushels. The banking capital of the city at the latest official reports was as follows: National banks, $6,472,418; State banks and private bankers, $3,612,908; total $10,085,326. *C.* has an annual *industrial exhibition* held in a building especially erected by a joint-stock Co. for the purpose, 200 feet wide and 800 feet long, which attracts exhibitors for one month from all parts of the Northwest. It was visited in Oct. 1878 by 296,510 persons, and the total expenditures for that year were $83,318, while the total receipts were $98,113.95. There are 18 trunk lines of railroads running from *C.*, five to the east, and the others west and south, viz.: The Baltimore and Ohio; Lake Shore and Michigan Southern; Pittsburg, Fort Wayne, and *C.*; Pittsburg, Cincinnati, and St. Louis; Michigan Central; *C.* and Michigan; *C.* and Alton; *C.*, Danville, and Vincennes; *C.* and Iowa; *C.*, Rock Island, and Pacific; *C.* and Northwestern (comprising 3 trunk lines); *C.* and Pacific; *C.*, Milwaukie, and St. Paul; Illinois Central; Western Union; *C.*, Burlington, and Quincy. The aggregate mileage of the railroads centring directly in *C.* is nearly 10,000 miles, and 750 trains arrive and depart daily. The Board of Trade of *C.* (an association consisting of 1799 on Jan. 1st, 1879) publishes yearly very copious and valuable reports, from which the following statements are partly taken.

Trade, Commerce, and Manufactures — The amount of trade for 1878 was estimated as follows: —

Produce trade	$207,400,000
Wholesale business	277,900,000
Manufactures	227,560,000
	$712,866,000
Less manufactures included in wholesale business	52,860,000
Total business	$660,000,000

The value of farm products shipped from *C.* in 1878 was as follows: —

Flour and Grain (equal to 118,675,269 bushels).	$68,150,000
Live Stock	34,300,000
Meats, Lard, Tallow, and Dressed Hogs	66,750,000
Butter and Cheese	10,750,000
Wool and Hides	17,250,000
Seeds and Broom Corn	3,800,000
High Wines and Alcohol	4,100,000
Miscellaneous Products	2,300,000
Total	$207,400,000

Flour. — The wholesale flour trade is each year becoming more and more strictly a local one, and hence is subject to few

fluctuations in sympathy with wheat The demand is more steady and continuous than it used to be, and the margins of profit to the seller seem to have been reduced to a minimum The movement of flour through the city in 1878 was fair in volume. Reducing bags to their equivalent in barrels, the receipts of the fiscal year were 3,121,445 barrels, against 2,691,142 in 1877; and the shipments were 2,845,840 barrels, against 2,482,305 barrels the previous year. The mills were kept running to their full capacity, but with no increase in their facilities of manufacture, the business not being profitable enough to induce the investment of new capital in mills. But the volume of receipts and shipments is no longer a correct idea of the magnitude of the wholesale flour trade A few years ago the millers of the West sent all their surplus flour to C to find a market, and it was sold there on orders for cargoes to go to the Eastern States and to Europe. But their production increased faster than C ability to sell, especially as the improvement in the methods of wheat handling enabled millers in the East and in Western Europe to obtain American wheat at relatively less cost than before. Then the millers began to solicit direct orders from bakers and retailers, and this has wrought a radical change in the trade. They now have their depots and agents scattered all over the East, consigning directly to them, and even in England, Scotland, and France the system prevails, — solicitors taking orders for small lots, and filling them by direct consignments from the mills in the West. C. millers operate in the same way, very little of their flour being placed on the wholesale market in their city. Hence, few large shipping orders are now received there. A large proportion of the flour " received " simply passes through the city on its way to the Eastern consumer, some of it being sent to C. to be submitted to our local inspection, which is everywhere highly valued. Some dealers thought that a partial revival of old-time activity might be secured by changing the system of flour inspection so as to make it conform to an Eastern model. At their suggestion new grades were established, ranging from " double extras " downward, but no appreciable improvement followed the reform The changes in the trade, above referred to, have made consumers acquainted with individual brands, and they now pay more attention to them than to any arbitrary classification made by non-manufacturers. The new grading is, however, a good thing, and will possibly be appreciated more highly in the future, when other conditions are more favorable to direct trade than they have been recently The *foreign demand* for flour from Western mills has fallen off, as well as that from Chicago The trade has suffered in the past by offerings of refuse flours from New England mills, and from those in the Southern States This has told especially in Scotland, where they use a better class of flours than in England. Another fact which tells against us is the high price which the bran, etc. commands in Western Europe for feed This enables foreign millers to sell their flour at very low prices, making their profit on the offal They have taken very largely of our low grades of wheat for mixing with other qualities, and, with low wages, make it difficult for Western millers to compete with them. They have also recently adopted patent processes quite extensively, but their work is still crude; their flours are not so well dressed as ours, and have less strength.

Wheat and *Corn* received and shipped for ten years: —

Years.	Wheat received.	Wheat shipped.	Corn received	Corn shipped
	Bushels	Bushels.	Bushels.	Bushels
1869..........	16,876,769	13,244,249	23,475,800	21,589,808
1870..........	17,394,409	16,432,585	20,189,775	17,777,377
1871..........	14,439,656	12,995,449	41,853,138	36,716,099
1872..........	12,724,141	12,160,046	47,293,087	47,013,552
1873..........	26,266,082	24,455,657	38,157,232	36,754 943
1874..........	29,764,622	27,634,587	35,799,038	32,706,224
1875..........	24,298,370	23,181,319	28,341,150	24,443,884
1876..........	16,574,058	14,361,950	48,028,640	45,629,036
1877	14,164,515	14,966,160	47,915 728	46,261,901
1878..........	29,713,577	24,211,759	63,651,518	59,941,299

The trade in corn assumed in 1878 a magnitude so far beyond any previous year that its volume is somewhat startling, the receipts having been nearly 15,000,000 bushels in excess of any previous year

Other Grain. — The shipments of oats in 1878 were 16,464,513 bu; rye, 2,025,654 bu, barley, 3,520,983 bu

Live Stock — The receipts and valuations of Live Stock received for 7 years, as compiled by Geo T Williams, Esq, Secretary of the Stock Yards Co, were as follows. —

Years	Cattle.	Hogs	Sheep	Horses	Total Value.
1872 .	684,075	3,252 623	310,211	12,145	$87,500,000
1873..	761,428	4,337,750	291 734	20,289	91,321,162
1874..	843,966	4 258,379	333,655	17,588	115,049,140
1875..	920,843	3,912 110	418,948	11,346	117,533,942
1876..	1,096,745	4,190,006	364,095	8,159	111,185,000
1877..	1,033,151	4 025,970	310 240	7,874	99,024,100
1878..	1,083,068	6,339,654	310,420	9,415	106,101,879

Pork Packing and Provision Trade. — C. now packs more hogs annually than were packed in the whole country west of the Alleghany Mountains some years since. This immense business is almost wholly conducted within a small area of territory near the southern city limits, and is but little seen, or its extent appreciated, by most of the people of the city, save by the occasional aroma which floats on the southern breeze. The business, which in former years was confined almost exclusively to the winter months, now extends over the whole year, so that the so-called packing season has come to have neither beginning nor ending In former years, pork packing meant, in the main, the packing of pork into barrels, now, less than 15 per cent of the product is so packed, the remainder being dry salted, and either shipped in bulk or in boxes The operations of the larger packing establishments are reduced to a science, and every step in the process is carefully guarded with reference to economy and the utilization of every particle of the slaughtered animal No feature of the business of C. will be a source of greater interest to the visitor than an inspection of some of these great establishments There are now two large establishments, each killing in the neighborhood of 8,000 hogs per day, and about forty others One of these almost rivals the two above referred to, but packs chiefly on English account The rest range from a daily " capacity " of 4,000 downwards; about one third of the number buying dressed hogs, or curing green meats, or have their hogs killed for them by other parties on commission They employ altogether about 7,800 workers, including foremen and clerks, during the four winter months, and nearly three fourths of that number during the remainder of the year. The aggregate weekly wages in cold weather is about $84,000, the pay of workers ranging from $1.50 to $4 per day. The general pay of laborers is $1.75 per day, or $10 50 per week. The following shows the number, weight, and value of the hogs cut in C during two calendar years: —

	1878.	1877.
January and February............	1,448,700	567,140
March 1 to October 31...	2,075,000	1,508,000
November and December..........	1,604,300	1,052 600
Total No. year............	5,128,000	3,127,740
Weight, tons........	648,200	388,000
Value	$44,610,000	$38,180,000
Value of product..................	55,590 000	43,400,000

The last-named value includes salt and packages. We note that the items of labor, salt, barrels, tierces, boxes, and ice during the hot weather foot up to just about $7,000,000 of the total, or not far from 15½ per cent addition to the original cost of the hogs, to which must be added the items of rent, taxes, insurance, fuel, water, and profits to give the whole value of the product of C. packing-houses for the year The limit of production is now the ability of C packers to dispose of the product The course of the market indicates that even more hogs would come there if they could be sold, and that many more would be bought if the stuff could be got rid of C leading packers have established agencies for its sale in almost all the principal cities of both the Old World and the New, and now ship it to nearly all the countries of Europe, besides not a few points south of the U States. The exports of hog products in 1878 had increased by 40 per cent or more over those of 1877, the great bulk of this movement being by way of New York Direct exports from C to Europe having been 549,225 boxes bacon and hams and 290,792 packages lard in that year, against 385,413 boxes bacon and hams and 139,649 packages lard in 1877.

Lumber. — The receipts and shipments of lumber and shingles in 1877 and 1878 were as follows: —

	Receipts.		Shipments.	
	1878.	1877.	1878	1877.
Lumber, m. ft...	1,171,934	1,096,452	618,108	586,723
Shingles, m.....	604,143	646,409	121,500	170,411

The receipts by lake in 1878 were 1,078,247 m ft. lumber, and 624,111 m. shingles

Manufactures. — The principal industries, besides hog-packing, are beef-packing, brewing, and distilling, and the manuf. of iron and steel, wool, brick, leather, boots and shoes, chemicals, and cigars and tobacco. The statistics of manuf on Jan. 1, 1879, were as follows: —

Number of establishments......	2,617
Number of workers.	67,504
Aggregate wages paid......	$31,007,000
Capital employed	85,782,000
Value of product............	227,500,000

Foreign Trade — The direct *exports* of domestic produce, mostly by railroads, consigned on through bills of lading issued in C direct to European ports, were: — Flour, 147,028 bar, wheat, 6,121,081 bu., corn, 4,149,552 bu.; oats, 183,874 bu barley, 25,334 bu, oat meal, 213 440 bu, corn meal, 9,601 bu; seeds, 2,952,851 lbs., hides, 826,102 lbs, leather, 282,539 lbs, bacon and hams, 549,225 boxes, pork, beef, and tongues,

67,010 pkgs.; lard, 290,792 pkgs; canned meats, 184,342 pkgs.; butter and cheese, 227,286 pkgs.; tallow, 18,005 pkgs.; oil-cake, 1.553 tons; alcohol, 29,231 bar; miscellaneous, 4,617 tons. Total, 602,018 tons, against 309,185 tons in 1877, and 113,776 in 1874. In the above figures are not included exports of domestic produce to Canada by lake, valued for 1878 at $3,206,261.

The direct *imports* of goods from Europe in 1878, of which dry goods were the principal item, amounted to $2,857,493, on which duties collected were $1,451,535. *C.* imported besides in that year 83,931 half-chests of tea by steamers via San Francisco, and 55,724 bags of Brazilian coffee by steamers and sailing vessels.

Marine and Shipping. — The vessels owned at the port of *C.* on Jan. 1, 1879, were as follows: —

Class.	No.	Tonnage.
Steamers	3	239
Propellers	18	6,108
Steam canal-boats	29	2,670
Tugs	57	1,690
Barks	9	3,029
Brigs	4	1.157
Schooners	245	53,705
Sloops	2	21
Total	367	68,619

During the year 1878, 12 vessels, tonnage 478, were built, and 7 schooners, aggregating 1,944 tons, and valued at $44,000, were lost.

The navigation on Lake Michigan is usually opened at the Straits of Mackinac in April. The last clearance for Buffalo in 1878 was on Dec. 5. The shipping for 1878 was as follows: — Number of vessels arrived, 10,490, with a tonnage of 3,608,534; vessels cleared, 10,494, with a tonnage of 3,631,139.

Chicago & Alton R.R. Main line from Chicago to East St. Louis, Illinois, 280.70 m.; branches and leased lines, 397.08 m.; total, 677.78. This Co., whose offices are in Chicago, was organized in 1861. In 1877, it took lease of the Mississippi River Bridge, at an annual rental of $63,000, to be applied in payment of 7% dividends on $300,000 stock, and 6% interest on $700,000 bonds. *Financial statement:* — Common stock, $10,065,400; preferred stock, $2,425,400; bonded debt, $8,579,850; aggregate stock and bonded debt, $21,070,650. *Equipment:* — Locomotives, 156; passenger cars, 54; sleeping and dining cars, 17; freight cars, 2,964. Net earnings for 1878, $2,103,568.12.

Chicago, Burlington, & Quincy R.R. Main line from Chicago to East Plattsmouth, Iowa, 488.54 m.; branches and leased lines, 860.71 m.; total length of road, 1,349.25 m. The leased line consists of the Quincy, Alton, & St. Louis R.R., which was leased in 1876, at an annual rental not exceeding $42,000. *Financial statement:* — Cap. stock, $27,729,916.51; bonded debt, $26,634,825; aggregate stock and bonded debt, $54,364,741.51. *Equipment:* — Locomotives, 309; passenger cars, 116; sleeping and dining cars, 15; freight cars, 8,532; Net earnings for 1878, $5,348,098.66.

Chicago & Eastern Illinois R.R. Main line from Danville to Dolton, Illinois, 128.13 m.; branches, 24.13 m.; total length, 152.50 m. This Co., whose offices are in Chicago, was organized in 1865, as Chicago, Danville, & Vincennes R.R.; it was sold under foreclosure in 1877 for $1,450,000, and reorganized under its present title. It leases the Chicago and Southern R.R. (from Dolton to Chicago, 266 m.), at a rental of $1,866.66 per month. *Financial statement:* — Cap. stock, $318.700; bonded debt, $4,000,000; floating debt, $127,318.83; aggregate stock, bonded and floating debt, $4,446,018.83. *Equipment:* — Locomotives, 28; passenger cars, 6; freight cars, 1,245. Net earnings for 1878, $194,-152.97.

Chicago & Iowa R.R., from Aurora to Foreston, Illinois, 80 m; leased line, Chicago, Rockford, & Northern R.R., 23 m.; total, 103 m. This Co, whose offices are in Rochelle, Ill., was organized in 1869, and opened in 1872. It connects the Chicago, Burlington, & Quincy R.R at Aurora with the Illinois Central at Foreston. *Financial statement:* — Cap. stock, $1,328,000; funded debt, $1,750,000; floating debt, $44,553.23; total, $3,122,553.23. The company made default on the interest of its bonds, due 1st August, 1877, and the road was placed in the hands of a receiver. Net earnings, 1877, $278,818.

Chicago, Iowa, & Nebraska R.R., from Clinton to Cedar Rapids, Iowa, 82.40 m., was opened 1859, and is leased in perpetuity to the Chicago & N.W. Co. The lease provides that the C. & N.W. shall operate the road and pay 37½% of the gross earnings as rental. *Financial statement:* — Cap. stock, $3,916,200; funded debt, $779,700; as follows: 2d (Nov. 1st) mortgage bonds, $568,200, payable 1880, interest 7% (Jan. & July); 3d (Nov. 2d) mortgage bonds, $211,500, payable 1892, interest 7% (Aug. & Feb.). Rental received for 1878, $545,536.87.

Chicago and Lake Huron R.R., from Chicago, Ill., to Port Huron, Mich., 329 m. Office, Port Huron, Mich. This Co. was formed in 1873 by the consolidation of the Peninsula R.R. Co., and the Port Huron & Michigan R.R. Has been operated by a receiver since 1874. *Financial statement*, 1877: — Cap. stock paid in, $5,775,000; funded debt, $5,518,000; sundry accounts, $873,395.28; other liabilities, $1,842,477.76. Description of bonds outstanding, 1877: 1st mortgage Penin. Div., issued 1869, $3,600,000, payable 1869, int. 7% (May & Nov.); 1st mortgage C. & I. R.R., issued 1870, $1,000,000, payable 1900, interest 7% (May & Nov.); 2d mortgage, issued 1870, $540,000, payable 1881, interest 7% (Aug. & Feb.).

Chicago & Michigan Lake Shore R.R., from New Buffalo, Mich., to Pentwater, Mich., 170 m., with branches from Holland, Mich., to Grand Rapids, Mich., 24.4 m., and from Muskegon, Mich., to Big Rapids, Mich., 51.2 m. Total length of road owned and operated, 245.6 m. The offices of this Co. are in Muskegon. Opened in 1872, and placed in hands of a receiver in 1876. *Financial statement*, 1877: — Cap. stock, $1,514,667.80; funded debt, $6,630,000; bills payable, $141,714.90; unpaid coupons, $1,723,800; sundry accounts, $753,-459.17. Character of bonds: 1st mortgage bonds, issued 1869, $477,000, payable 1889, interest 8% (Mar. & Sept.); 1st mortgage bonds, issued 1870, $3,523,000, payable 1890, interest 8% (July & Jan.); 1st mortgage bonds, issued 1871, $1,350,-000, payable 1891, interest 8% (Nov. & May); 1st mortgage bonds, issued 1872, $1,380,000, payable 1892, interest 8% (Mar. & Sept.).

Chicago, Milwaukee, & St. Paul Railway, located in Milwaukee. The total length of line owned and operated by this Co. is 1,512 m. *Financial statement:* — Cap. stock (preferred), $12,279,-483; common, $15.404,261; bonds of various issues, $32,088,500; other liabilities, $791,592.61; total liabilities, $60,563,836.61; cost of road, $58,-755,184.22; bonds, miscellaneous accounts, cash on hand, etc., $4,328,726.41; total assets, $63,083,-910.63. Net earnings for 1878, $3,672,884.91, from which have been paid interest on bonds and dividend on preferred stock, $2,620,512.46, leaving net surplus for the year, $1,052,372.45.

Chicago & Northwestern R.R. This powerful Co., located in Chicago, is a consolidation (June, 1864) of the Chicago & Northwestern R.R., the Galena & Chicago Union R.R., and the Peninsula R.R., which, together with railroads since constructed and purchased, extend to 1,615.96 m. The lines leased are the Winona and St. Peter R.R., 327 m.; Winona, Mankato, & New-Ulm

Fig. 71. — Chick-Pea.

R.R., 3.75 m.; Iowa Midland Railway, 68.80 m.; and Northwestern Union Railway, 62.03 m. Total length of lines operated, 2,078.14 m. *Financial statement:* — Common stock and scrip, $14,988,-807.49; preferred stock and scrip, $21,525,602.72; bonds of various issues, $32,793,000; other liabilities, $3,603,924.90; total liabilities, $72,911,335.11; cost and equipment of all the roads, $72,673,894.26; bonds, securities, cash, materials on hand, etc., $4,414,436.02; total assets, $77,088,350.28. Net profit for the year 1878, after payment of interest on bonds, etc, $2,464,487.16; from which have been paid two dividends of 3½% each on preferred stock (Dec. 30, 1877, and May 16, 1878), $1,506,-568; and 3% on common stock (May 16, 1878), $449,468, leaving surplus for the year, $508,453.16.

Chicago, Pekin, & Southwestern R.R., from Pekin to Mazin Bridge, Ill., 94 1 m. Chartered in 1859, as the Chicago & Plainfield R.R. Co., and opened to its present terminus in 1876. Offices in Chicago, Ill. *Financial statement*, 1877: — Cap. stock paid in: common, $788,200; preferred, 38,000, bearing 7% interest; total, $826,200. Funded debt: 1st mortgage 7% bonds, $1,000,000, payable 1891. Floating debt, $270,000. Total stock, bonds, and debt, $2 096,200. In 1877, the road was placed in the hands of a receiver. Net earnings, 1878, $43,391.52.

Chicago, Rock Island, & Pacific R.R. Main line from Chicago to Council Bluffs, Iowa, 500 25 m.; branches and leased lines, 502.75 m.; total miles of railroad operated, 1,003. Offices in Chicago. In 1877, the property formerly known as the Chicago & Southwestern R.R., now Iowa Southern & Missouri Northern R.R., passed fully under the control of this Co. *Financial statement:* — Cap. stock, $20,980,000; bonded debt, $15,000,-000; floating debt, $392,874 98; aggregate stock, bonded, and floating debts, $36,372,874.98. *Equipment:* — Locomotives, 229; passenger cars, 73; sleeping and dining cars, 16; freight cars, 4,702. Total cost of construction and equipment, $33,-710,120.85. Net earnings for 1878, $3,511,356.26; surplus for the year, after payment of interest on bonds, rentals, and four quarterly dividends (2% each), $935,647 23.

Chick, a name for the inspissated juice of the poppy, three pounds of which will make one of opium.

Chicken Mother-of-Pearl, a small and fine kind of Manilla pearl oyster-shell.

Chick-Pea, a leguminous plant, the *Cicer arietinum* (Fig. 71), which is a common crop in India, where it is known as *gram*. It is also cultivated in the South of Europe. Its seeds are parched, and in Spain are sold in the shops for food. When roasted, these seeds are said to sustain life longer than other food in similarly small quantities, hence they are much used by travellers through the deserts, where the carriage of bulky food is inconvenient.

Chicory, a hardy perennial plant with blue flowers, *Chicorium intybus*, found wild in most parts of Europe and U. States. It resembles a dandelion. Its slender roots are much employed in France for forcing into growth in dark apartments, during winter, the delicate blanched leaves, which are quite bitter, being used as a salad under the name of *barbe de capucin*. The large tap-roots are sliced and dried in kilns; they are then roasted and reduced to powder, and this, when boiled, yields a drink not unlike coffee. C. is perfectly wholesome, containing no alkaloid or oil, and only a small amount of narcotic matter. When added to coffee in small quantities, it rather improves its flavor, neutralizes its oil, and renders it less difficult of digestion. Many persons prefer the coffee with C. The adulteration of coffee with C. is easily detected. Roasted coffee imparts its color very slightly to cold water, but C. colors the water a deep reddish brown. Coffee is light, and floats on the surface of the water; C. is heavy, and sinks to the bottom. 3,153,329 lbs., valued at $100,358, came to this country in 1878, mostly from Germany and England. *Imp.* duty, ground or unground, 1 ct. per lb.; burnt or prepared, 5 cts. per lb.

Fig. 72. — Microscopic appearance of Chicory Root

The ground C. of the shops, like ground coffee, is almost universally adulterated. Pigments are added to it to color it, and various vegetable substances to lessen its value. Adulteration may be detected by the following tests: — 1. Powdered C. thrown on water turns it reddish brown and rapidly sinks, leaving light impurities either floating or diffused through the liquid. — 2. The cold decoction tested with tincture, or solution of iodine, gives a brown color. If it turns purple, blue, or black, it indicates the presence of roasted peas, beans, rye, or some other like substance, containing starch. — 3. Persulphate or perchloride of iron, added in the same way, should not materially affect the liquid; if it turns it bluish or blackish, it indicates the presence of roasted acorns, oak-bark tan, or some other substance containing tannin. — 4. Water acidulated with vinegar, digested on the powder, should not be blackened, or even materially darkened, by tincture of galls, or a solution of red prussiate of potash; the contrary shows the presence of

ferruginous coloring matter. — 5. The dry powder, when incinerated, should not leave more than 4½ to 5% of ash, which should be of a grayish or fawn color; the contrary indicates the presence of reddle, red clay, ochre, or the like. — 6. To the above may be added attention to the odor, color, and appearance, both to the naked eye and under the microscope (Fig. 72); by the latter, adulteration may be easily detected.

Chik, a bamboo mat to hang at the entrance of a room in India; they are sometimes lined with cotton.

Chikan, the Hindustani name for embroidering and working flowers on muslin.

Chiksa, a fragrant Indian powder composed of sandal-wood, andropogon, benzoin, and other aromatic ingredients.

Chile, or **Chili**, a republic of S. America, occupying a strip of land on the W. side of that continent, extending from 24° to 56° 28′ 50″ S. lat. from the Bay of Mejillones to Cape Horn, a distance of 2,270 m. It is bounded E. by the Andes,

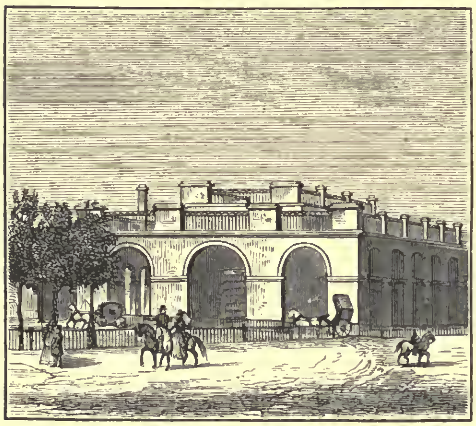


Fig. 73. — Custom-House of Valparaiso.

W. by the Pacific Ocean, and N. by Bolivia. Its breadth varies from 40 to 200 m. Area (including the archipelago of Chiloë, but excluding the newly annexed territories, and the land of the Araucanians, which is claimed by the republic, and which is calculated to embrace 120,000 sq. m., within which live about 70,000 inhabitants) 132,606 sq. m. *C.* is divided into the 16 prov. of Chiloë, Llanquihue, Valdivia, Arauco, Concepcion, Nuble, Maule, Linares, Talca, Curico, Colchagua, Santiago, Valparaiso, Aconcagua, Coquimbo, and Atacama. Pop. (census of 1875) 2,068,447, chiefly Spanish-Americans and Indians. Subsequently to the census, the prov. of Biobio, the territory of Angol, and the settlement of Arauco, have been annexed, which brings the total pop. of *C.* up to 2,283,568. Capital, Santiago, a handsome inland city; pop. 129,807. The legislative power is vested in two assemblies, called the Senate and the Chamber of Deputies. The executive is exercised by a President, elected for a term of five years. "The Chilians themselves hold the same position to Spain as the inhabitants of the U. States do towards England. Their interests and language are Spanish, modified by admixture with other nations. The conventionalities of social life are much the same in *C.* as in France and Catholic Germany; and this remark applies to dress, living, amusements, and propensities. Sunday is spent as a holiday, and enlivened by festivals, balls, theatricals, and concerts. The great extent of seaboard not only induces large numbers of the inhabitants to visit foreign lands, but promotes the diffusion of the civilization of the most highly cultivated nations over the whole of *C.* The beautiful prov. of Valdivia and Llanquihue are colonized by Germans and North Americans, who prepare timber, meat, cheese, butter, beer, cider, and leather. The university and the learned professions have ever numbered among their distinguished members, Polish, French, German, and English men of science. The North American colonists have been chiefly instrumental in the construction of flour-mills, telegraphs, and railways."

The lofty chain of the Andes runs along the whole eastern boundary of *C.*, and the country below is composed, to a considerable extent, of valleys, surrounded by high mountains or ridges. The climate varies much in the different districts, but it is everywhere salubrious, and in the central provinces is similar to that of Italy. Rain occurs seldom except between May and August. Spring begins in Sept., and the hottest months are Jan. and Feb. The northern provinces are in general dry and sterile, destitute of wood, but rich in minerals. On the other hand, the southern provinces are humid, highly fertile, and abound in fine timber, but are much less rich in minerals. The chief metallic productions of Chili are gold, silver, and copper, but the sterile condition of the provinces in which they are principally found prevents the mines from being worked except where very rich. Gold is obtained both from the sand of the rivers and from mines. The copper mines are exceedingly numerous between the cities of Copiapo and Coquimbo, and form one of the chief sources of national wealth; lead and iron are found in abundance, but neither is much sought after. Zinc, antimony, manganese, arsenic, tin, sulphur (so pure as not to need refining), alum, salt, and nitre are plentiful. Coal mines have been opened, and this article has become a considerable article of trade at Valparaiso. Agriculture has been much improved. The largest and most approved agricultural implements manufactured in the U. States are now employed, while the flour-mills in power and machinery rival the best in this country. About 82 per cent of the entire surface of *C.* is desert, mountain pasture, and forests, and only about 18 per cent arable land. Intertropical plants do not succeed in *C.*; and the sugar-cane, after being tried, was abandoned. Wheat is the great staple; Indian corn, barley, and hemp are also leading objects of culture; and the latter is of a quality even superior to that of Russia. The vine and olive are also cultivated extensively; but the wine and oil manuf. are of indifferent quality; wine-making, however, is progressing rapidly. The rearing of stock forms an important source of wealth; the pastures N. of the river Maule are filled with innumerable herds of cattle; and swine are abundant in the archipelago of Chiloe. The wealth of *C.* consists in the development of its great and abundant resources, for which its scanty population is insufficient; hence manuf. which require many skilled hands and much cheap labor have as yet not prospered, — the cost of labor being too great. But such works as flour-mills, smelting-works, tanneries, breweries, roperies, and soap-works, have long proved successful. — The commerce of *C.* has vastly increased since its separation from Spain, but very little in recent years. The imports average now $29,000,000, and the exports $30,000,060. The principal exports are copper in bars and ores (nearly 50 per cent of total exports), silver in bars and ores, wheat, flour, biscuits, barley, wool, etc. Of the imports 17 or 18 per cent are for nutrition, such as sugar, rice, and cattle; 20 to 21 per cent are necessaries of social life, as clothing, domestic utensils, crockery, drugs, machinery, tools, books, paper, etc.; and 13 to 14 per cent are articles of luxury, such as rich carpets, silks, toys, perfumery, tobacco, pictures, jewelry, tea, coffee, etc. Tea was formerly largely imported from China, but it has been in great part superseded by the *maté* or Paraguay tea, the dried leaves of the *Ilex paraguayensis*. Nearly 60 per cent of the exports go to Great Britain, while the imports are from England, France, Germany, the U. States, and Peru. The imports from Great Britain, from $16,000,000 in 1874, have gradually fallen down to $6,500,000 in 1878.

In 1878, the total *imports from the U. States* amounted to $1,977,450. The principal articles imported were: wheat and wheat flour, $127,927; manuf. cotton, $573,128; manuf. of iron, $130,975; mineral oil, $111,891; lard, $127,160; refined sugar, $332,035; wood (boards, deals, etc.), $165,411; household furniture, $46,602. The total *exports to the U. States* during the same year were $670,466, consisting chiefly of nitrate of soda, $261,525; and wool, $314,712.

The commercial navy of *C.* consisted, in 1878, of 87 vessels of 22,434 tons, including 22 steamers of 9,641 tons.

C. was among the first States in S. America in the construction of railroads. In 1879, the total length of lines open for traffic was 977 m. The length of telegraph lines in same year was 2,650, the whole of them, with the exception of a short line from Santiago to Valparaiso, belonging to the State.

Finances. — The annual income of *C.*, mainly derived from customs duties, is about $17,500, and the expenditures sometimes a little more and sometimes a little less. The national

debt amounts to about $63,000,000, of which about $17,000,000 is of internal, and $46,000,000 of external debt The whole of the foreign loans were contracted in England, the last, of 1875 (5 per cent interest), at the price of 88¼ per cent. There is no government paper in C., but some of the banks issue, under due restrictions, notes payable in coin. Numerous banks and insurance cos. are conducted under the principle of limited liability.

VALPARAISO, a fine city and sea-port, in lat. 33° 1' 56" S., lon. 71° 41' 45" W., 90 m. W. N.W. of Santiago, on Valparaiso Bay, is the cap. of a prov. of the same name, and the centre of the foreign trade of *C.* It stands on a rugged promontory, forming, with the shore, a deep crescent, the concavity of which, opening to the N., forms the harbor, where ships of any size may ride in safety against all winds, except those from the N., which blow with great violence along the whole coast in the beginning of the rainy season. It is one of the principal places of rendezvous for ships on the Pacific sea-board. Pop. 97,775

The chief other ports are Concepcion, pop. 19,000; Caldaira (the port of Copiapo), pop. 7,000, Coquimbo, the principal port of the mining region, pop 17,000 and Valdivia, pop. 2,000.

Weights and Measures. — The metric weights and measures of France were adopted in 1858, and are since the only legal ones. The following old *W.* and *M.*, however, are still in general use: — The ounce = 1.014 oz. avoirdupois; the libra = 1 014 lb.; the quintal = 101 44 lb., the vara = 0 927 yards; the square vara = 0.859 sq. yd

Money. — The *peso* or *dollar*, of 100 *centaros* (gold) = $.912. In the monetary system *C.* possesses the double standard, gold and silver, the coins being as follows: — Of gold, a 10 dollar piece, weighing 15 253 grammes, and pieces of 5 and 2 dollars in proportion; of silver, a dollar piece of 25 grammes, and pieces of 50, 20, 10, and 5 cents in proportion; and also two-cent pieces, and cent pieces, of a bronze containing zinc and nickel. The gold and larger silver coins contain one tenth of alloy; the smaller silver ones, which are of limited legal tender, are rather less pure.

Chilian Pine, the *Araucaria imbricata*, a handsome, lofty tree, valuable not only for its beauty, but for the large seeds in the pine-cones, which supply the natives with a great part of their usual food.

Chillies, a name given to the small pungent pods or fruit of the *Capsicum annuum*, which, when pounded and ground, form Cayenne pepper.

Chilloes, colored cotton goods used in the African trade, made in lengths of 18 yards by 29 inches wide.

Chiloë (ISLAND AND ARCHIPELAGO OF), a prov. of Chili, consisting of a large island in the S. Pacific, near the S. coast of Chili and the N.W. coast of Patagonia, between lat. 40° 48' and 43° 50' S.; and having on its E. side 63 small islands, 36 of which are inhabited. The group, including the town of Maulin, on the main-land of the continent, forms the most S. prov. of Chili. Shape of the island of C., oblong; length, N. to S., 120 m.; average breadth, 40 m. *Area*, 4,800 sq. m. The island is mountainous and wooded, chiefly with a bastard cedar, very durable, and exported in great quantities to Peru and Chili. There are several good harbors; in those of San Carlos (the cap., in the N.E. part of the island), and Castro, vessels ride quite land-locked close to the shore, in good holding ground. The island swarms with hogs, and the hams of C. are celebrated in S. America. Population of prov., 61,536.

Chimes, the ends of the staves of a cask, which come out beyond the head. — The ringing of church bells.

Chimney, the gullet, funnel, or passage through which smoke is conveyed to the open air; a flue. — A glass tube or funnel for a lamp. See SMOKE-STACK.

Chimney-Piece, a projection over the front of the fire-place of a room; also called mantel-piece.

Chimney-Pot, an addition to the top of a chimney, of metal or pottery ware.

Chimney-Sweeping-Machine, a series of connecting rods, by which a stiff whalebone brush is raised through the chimney to cleanse it from soot.

Chimo, a nutritive food made in Peru from potatoes, which are first frozen, and afterwards reduced to powder.

China, a vast empire of Asia, extending from 18° 30' to 53° 25' N. lat., and from 80° to 130° E. lon. It is bounded, N., by Asiatic Russia, along a frontier extending nearly 3,000 m.; E., by the Sea of Japan, the Yellow Sea, and the China Sea, which are parts of the Pacific Ocean; S. and S.W., by the China Sea, Cochin China, and Burmah; W., by Kashmir and Eastern Turkestan. In these limits are included, besides China Proper, the dependencies of Manchuria, Mongolia, and Thibet. The capital of the empire is *Peking*, in the Province of *Chih-le*, in 39° 50' lat. N., 116° 30' lon. E.; pop. 2,000,000. The pop. of C. is believed to be very dense, but nothing accurate is known respecting either the area or the number of inhabitants. According to various missionary reports, none of which, however, can lay claim to be more than vague estimates, the area of the empire and its dependencies embraces 3,924,627 sq. m., with a pop. of 425 millions, distributed as follows: —

	Area — sq. miles.	Population.
China Proper	1,534,953	405,213,152
Dependencies: —		
Manchuria	362,313	3,000,000
Mongolia	1,288,035	2,000,000
Thibet	643,734	6,000,000
Corea	90,300	8,000,000
Liaotong	2,982	1,000,000
Total	3,924,627	425,213,152

The above population, giving 263 souls per sq. m. throughout *C.* proper, appears to be excessive, considering that some of the outlying portions of the immense territory are by no means densely inhabited. Nevertheless, other returns give still higher figures. It is stated that in 1842 the pop. of C. was officially ascertained to number 414,686,994, or 320 per sq. m., and that in 1852 it had risen to 450,000,000, or 347 inhabitants per sq. m. There is great probability that the present pop. of *C.*, devastated as the country has been for years by internecine wars and occasional famines, does not surpass 300 millions. According to a return of the Imperial customs authorities, the total number of foreigners in *C.* was 3,661 at the end of 1872. Among them were 1,771 natives of Great Britain and Ireland, 541 of the U. States, 481 of Germany, and 239 of France; all other nationalities being represented by very few members. More than one half of the total number of foreigners, viz. 2,047, resided at Shanghai, and 308 at Canton, the remainder being scattered in small numbers over the ports open to foreign commerce.

The government is a despotic monarchy. There is no law of hereditary succession to the throne, but it is left to each sovereign to appoint his successor from among the members of his family. The fundamental laws of the empire are laid down in the *Ta-tsing-hwei-tien*, or "Collected Regulations of the Great Pure Dynasty," whi h prescribes the government of the state to be based upon the government of the family. The Emperor is spiritual as well as temporal sovereign and, as high priest of the empire, can alone, with his immediate representatives and ministers, perform the great religious ceremonies No ecclesiastical hierarchy is maintained at the public expense, nor any priesthood attached to the Confucian or state religion The administration of the empire is under the supreme direction of the "Interior Council Chamber," comprising four members, two of Tartar and two of Chinese origin, besides two assistants from the *Han-lin*, or Great College, who have to see that nothing is done contrary to the civil and religious laws of the empire, contained in the Ta-tsing-hwei-tien, and in the sacred

books of Confucius. These members are denominated *Ta-hyo-si*, or Minister of State. Under their orders are the *Liu-poo*, or six boards of government, each of which is presided over by a Tartar and a Chinese. They are: — 1. The board of civil appointments, which takes cognizance of the conduct and administration of all civil officers; 2. The board of revenues, regulating all financial affairs; 3. The board of rites and ceremonies, which enforces the laws and customs to be observed by the people; 4. The military board, superintending the administration of the army; 5. The board of public works; and 6. The high tribunal of criminal jurisdiction. Independent of the government, and theoretically above the central administration, is the *Tu-chah-yuen*, or board of public censors. It consists of from 40 to 50 members, under two presidents, the one of Tartar and the other of Chinese birth. By the ancient custom of the empire, all the members of this board are privileged to present any remonstrance to the sovereign. One censor must be present at the meetings of each of the six government boards.

Manchuria, Mongolia, and Thibet are comparatively thinly peopled territories, inhabited by wandering and semi-barbarous tribes, who are held as tributaries, or under loose military government, without any attempt to impose on them the laws and general character of *C* itself. The source of the vast wealth of the state is to be found in *C.* Proper, the local features of which are understood to possess the same character of vastness, pervaded by a certain sameness approaching to monotony, which generally distinguishes the empire. The number of provinces is nineteen (of which one is Manchuria), and these are subdivided into districts, each dependent on one of the great cities. These last, according to their importance, are arranged in three classes, generally expressed by the terms *foo* and *chow* annexed to their names. The northern, central, southern, and western provinces possess each peculiar and distinctive characters.

1. *The Northern Provinces* — Chih-le, Shan-tung, Shing-king, and Shan-se — consist of very extensive plains, rising on the N. and W. into mountains or high table-land which form the lower declivity of the lofty chain that traverses Mantchoo Tartary. The winter is extremely rigorous compared with that of European countries under the same latitude; so that all the rivers, not excepting the largest, are then frozen. Hence, though the summers are proportionately hot, the more valuable articles of rice, silk, and tea, which constitute the pride of Chinese culture, cannot be reared: even wheat does not successfully resist the cold, and millet is therefore the standard grain. The high grounds wear somewhat of a pastoral aspect, and support several domestic animals, which have been banished from the more cultivated provinces. The fine manufactures that distinguish *C.* are also unknown, though there are some remains of the woollen fabrics in which she anciently excelled. The mineral products consist of iron, large quantities of coal, with lapis-lazuli, and other varieties of beautifully colored stone. This district contains the capital, Peking, which is situated in Chih-le; and its northern boundary for 1500 miles is the celebrated Great Wall, composed of two parallel brick walls, 24 feet in height, and twelve feet apart, the interval between which is filled with earth, and towers are erected at distances of 300 or 400 feet.

2. *The Central Provinces* consist of Honan, Keang-soo, Ganhwuy, Keang-si, Che-Keang, Hoo-Pih, and Hunan, which form decidedly the finest part of the empire. All its most valuable productions, all its finest fabrics, are here reared or manufactured. This territory consists, with little interruption, of an immense plain, through the midst of which flows the great river Yang-tse-kiang, while the numerous tributaries which fall into it from both sides, as well as those flowing northwards to the Hoang-ho, render it one of the best-watered regions upon earth. Indeed, the excess of moisture, as it renders some districts marshy, is the chief disadvantage under which it labors. Keang-soo is the province in which the riches and beauty of this part of *C.* are most amply displayed; all the products of nature and art being carried to a perfection unequalled in any other. The rice and wheat are excellent; the silk is rivalled only in Che-keang; cotton is nowhere so good. The song-lo, or green tea, the most delicate of that species, grows only on the hills of Keang-soo, and in Che-Keang, chiefly the former. The people are said to be more intelligent, and Nan-king, its chief town, was in former ages the capital, and still is the literary metropolis of the empire, and its finest city. It is celebrated for its porcelain tower, and for its flourishing manufactures, — the satins, the cotton cloth bearing its name, and its ink and paper, which are superior to any made elsewhere. Che-Keang, the rival of Keang-soo, forms, in a great measure, a continuation of the same vast plain, equally fertile and beautiful. In particular, it is completely pervaded by rivers and canals, covered with innumerable barks. All the tropical productions flourish here to a great extent; but that of silk is particularly distinguished for its quality and abundance. The commerce and manufactures of its capital, Hang-choo-foo, rank it with the greatest cities in *C.* Silks, particularly flowered taffetas, and different kinds of satin, are its peculiar staple. Keang-si, though to a considerable extent mountainous or marshy, shares in some degree the manufactures of the neighboring provinces, but is chiefly distinguished for the finest porcelain, which is exclusively confined to King-tih-chin, one of its towns, said to contain 1,000,000 inhabitants. The other provinces in this district are less distinguished for their productions, whether natural or artificial.

3. *The Southern Provinces* are composed of Kwang-tung, or Canton, Foo-keen, and Kwang-si. These consist of the level country intervening between the sea and the extensive mountain chain which is prolonged from the Himmaleh, along the whole south of *C.*, with an elevation diminishing in its progress eastward, and which forms a steep barrier separating them from the rest of the empire. High ranges also shoot across them, and terminate in rugged cliffs. In the intervals, however, are many valleys, and even extensive plains, that rival the finest of the central provinces, and are cultivated with equal diligence, though they yield no very valuable productions, except the bohea tea, reared chiefly on the hill-slopes of Fookeen. The manufactures are various and actively pursued, yet none of them can match those of Nan-king, Hang-choo-foo, and King-tih-chin. The coast, however, is the seat of nearly all the foreign trade of the empire. Its position relative to the eastern peninsula and archipelago, its fine harbors, even the ruggedness of many of its districts, seem to have united in turning the industry of the people in this direction. Canton is the oldest seat of the trade with Europe and America, while the Chinese junks sent to the neighboring coasts and islands are almost all fitted out from the ports of Foo-keen. A bolder and more enterprising race, addicted to maritime adventure and even to emigration, inhabits these shores.

4. *The Western Provinces* bordering on Mongolia, Thibet, and Manchuria, are Sze-chuen, Yun-nan, Kwei-choo, Shen-se, and Kan-suh, but our knowledge of them is more imperfect than of any other quarter. According to every description hitherto received, their aspect, productions, and social state differ very widely from those of the other parts of the empire. The mountains are much loftier, and their recesses are occupied to a great extent by the Miao-tse, Lolos, and other independent and almost savage tribes. This region, however, is not altogether sterile or unproductive; there are some extended plains, and the mountains are generally interspersed with rich and beautiful valleys. The store of metals and minerals is particularly ample, including gold, silver, and copper. On the hills of some districts are rhubarb and other medicinal plants; and among the numerous wild animals is the one which yields musk. The rivers afford commodious channels for transporting those articles through the whole empire.

Besides these 18 provinces, the Chinese possess various islands on the coast; the principal, Formosa, being on the west, and Hainan on the south. *Formosa* forms part of the province of Foo-keen. It is situated at about 80 m. from the mainland, stretching from lat. 21° 53′ 30″ to lat. 25° 33′. The fertility of the plains has gained for Formosa the name of the Granary of *C.* On every available piece of land fields of rice and sugar are carefully cultivated, and recompense the farmer by yielding him constant and abundant crops. These alone, in addition to such products as jute, grass cloth, fibre, rice paper, and ratan, would make the island a valuable possession; but far more precious are the sulphur and the camphor which are obtained from the mines and the mountains of the island, and which are claimed by the government as crown monopolies. As the gigantic laurels from which the camphor is obtained are in the possession of the natives, the acquisition of a constant supply is somewhat difficult. About 14,000 cwt. of this commodity are, however, annually exported from the ports of Tam-say and Kelung. The Treaty Ports in Formosa are *Tai-wan-Foo* (including *Ta-kow*), on the S.W. coast, and *Tam-say* (including *Kelung*), on the S.W. and N. coast.— *Hainan* is the largest of several islands situated on the coast of the province *Kwang-tung*. It extends for about 100 m. from N. to S., and the same distance from E. to W. Gold is found in its central part; and sugar, cocoa-nuts, betel-nuts, birds' nests, and agar-agar, or sea-vegetable, are among the other products of the island. The Chinese have long been represented as averse to all traffic; but we actually well know that no people are more solicitous to acquire riches, or less fastidious as to the means, and that the wealthy class are as desirous as in any other land to procure whatever appears to them useful or agreeable, without any scrupulous inquiry as to how or whence it comes. *The Internal Trade* of this vast country constitutes by far the most important part of its commerce. The variety of climate and productions throughout the empire renders the provinces mutually dependent upon each other, and affords ample scope for exchange; while the traffic is increased by the circumstance that the court, and with it the great body of opulent families, is resident at Peking, near the northern frontier, and in a country which yields scarcely a single article of elegance or luxury. Tea, the universal beverage, though produced in almost every province, is not to be found of fine quality except in the few districts already mentioned. Rice is raised only in the central and southern divisions, whence the whole consumption of the north must be furnished. Sugar is confined within nearly the same limits. The silk and cotton manufactures are carried to perfection only in the great cities of Keang-soo and Che-keang; porcelain only at King-tih chin. Timber grows only on the mountains, and chiefly on the southern range. Salt, a government monopoly,

exists in mines as well as rock springs, but is principally procured from sea-water on the eastern and southern coasts. Although these are the principal commodities, there are obviously many others, the conveyance of which, on a scale requisite for the wants of so vast a population, must give occasion to a very extensive commerce. This great trade is conducted almost entirely by means of water communications, consisting not only of the great rivers, particularly Hoang-ho and Keang-ku, with their tributaries, but also of canals, with which almost the whole empire is furrowed, and upon which the Chinese have made the most lavish display of their industry and resources. The principal is the Imperial Canal, which extends 500 miles in Shang-tung and Keang-si. Compared with this grand system of water-communication, land-carriage is little regarded, and few of the roads are better than footpaths; though, when one does become actually necessary to connect any of their points of intercourse, the inhabitants spare neither labor nor cost in making it complete. The coasting trade is discouraged by government, on account of its diminishing the internal transit-dues. It is, however, pretty extensive. It is stated that the most populous part of *C.* is singularly well adapted for the establishment of a network of railways, and a first attempt to introduce them into the country was made by the construction of a short line from Shanghai to Woosung, 40 m. in length. One half of this line, from Shanghai to Kangwang, was opened to traffic June 3, 1876, but closed again, having been purchased by the Chinese authorities.

A Chinese ship or *junk* is seldom the property of one individual. Sometimes 40, 50, or even 100 different merchants purchase a vessel, and divide her into as many different compartments as there are partners; so that each knows his own particular part of the ship, which he is at liberty to fit up and secure as he pleases. The bulk-heads, by which these divisions are formed, consist of stout planks, so well calked as to be completely water-tight. A ship thus formed may strike on a rock and yet sustain no serious injury; a leak springing in one division of the hold will not be attended with any damage to articles placed in another; and from her firmness she is qualified to resist a more than ordinary shock. A considerable loss of stowage is, of course, sustained; but the Chinese exports generally contain a considerable value in small bulk. It is only the very largest class of junks that have so many owners; but even in the smallest class the number is very considerable.

The External Commerce is inconsiderable when compared to the great resources of the country. This has arisen partly from the variety of productions and manufactures exchanged by means of the vast internal trade, but chiefly from the restrictions imposed upon the foreign trade by the Chinese government. The principal article of *export* is tea, and it is mainly owing to the diffusion of the taste for it, and its consumption by all classes of people, that the foreign trade of *C.* has attained its present importance. The other articles of export are raw silk and silk manufactured, cassia lignea, and a few more; but they are of very inferior value and importance as compared with tea. The principal articles of *import* are opium, cotton and woollen goods, mineral oil, etc. The commercial intercourse of *C.* is mainly with India, Great Britain, and the U. States. The exports to Great Britain consist mainly of tea and raw silk. The imports of British produce, consisting for the most part of manufactured cotton and woollen goods, are gradually decreasing, the value of total imports from that country in 1877 being $22,023,430, against $33,141,180 in 1871.

The commerce of *C.* with the U. States is second in importance only to that with Great Britain. Its increase during the few last years has been considerable, and the textile industries of America, especially the manufacture of cotton, are rapidly gaining in favor and reputation, while the consumption of the British-made piece goods, which come into competition with our own, is on the decrease. The total imports of American goods into *C.* amounted in 1878 to $11,430,098, and the total exports to $15,895,379. The principal articles of *imports* were: — Cotton manufactured, $2,557,556; mineral oil, $597,259; cartridges, $109,013; silver bullion, $7,762,008. The principal articles exported were: — Tea, $9,218,005; raw silk, $2,957,-617; rice, $817,973; opium, $931,183; palm-leaf, $376,899; brown sugar, $137,061

The U. States have, in virtue of various treaties with the Chinese government (the first and most important signed June 18, 1858), the right of access to 21 ports of the empire, known as treaty ports, and divided into 11 primary or consular ports (in each of which the U. States have a consulate), and 10 secondary ports, the first class comprising *Canton*, *Amoy*, *Foo-chow*, Ningpo, Shanghai, Swatow, Tientsin, *Chee-foo*, *Hankow*, *Kiukiang*, and Newchwang. By an additional convention, made in 1876, the Chinese government consented to open, on the 1st of February, 1877, three more towns to foreign trade, namely, Wenchow, a seaport between Foo-chow and Ningpo, Woo-hoo, on the lower Yang-tse, beyond Nankin, and Ichang, on the Upper Yang-tse, 350 m. further inland than Hankow, and nearly in the centre of the Empire. The following are the most important ports open to foreign trade: —

AMOY, in Foo-keen Co., on an island called Hia Mun, lat. 24° 40′ N., lon. 118° E. It is the most accessible of all the consular ports in *C.*, no pilots being required on entering or departing, though boatmen often board the ship to offer assistance. Some regulations were once issued requiring merchantmen to engage pilots to and from the Chau Chat rocks, but their use is now optional. The water communication with the interior is not, however, equal to that enjoyed by the other ports. The harbor is a bay, and an inner harbor. The inner harbor is one of the best on the coast. There is good holding ground in the outer harbor, and vessels can anchor in the inner, within a short distance of the beach, and be perfectly secure. The tide rises and falls from 14 to 16 feet. The western side of the harbors, from 675 to 840 yards wide, is formed by the island of Kulangsu. The channel round the island of Amoy is so narrow and winding that directions would be useless, the chart being the best guide. Besides the excellent shelter that this harbor affords, the Chinese have docks for repairing and building their largest junks. The docks are worthy of notice. Vessels of almost any size can obtain anything necessary for repairs. The company's large granite dock is 286 feet long on the blocks, and at average springs can take vessels drawing from 16 to 17 feet. The dock is fitted with a caisson gate, and with a centrifugal steam pump of great power, insuring despatch at all states of the tide. Pop., 300,000.

CANTON, formerly the chief commercial mart of *C.*, is the capital of prov. Kwang-tung, in lat. 23° 7′ 10″ N., lon. 113° 14′ 30″ E., on a broad and navigable tidal stream, the Chu-Kiang, or Pearl River, forming one of the channels by which the united waters of two great interior streams, the North and West Rivers, reach the sea. Canton is situated in the most southerly of the provinces on the seaboard of *C.* This province is traversed from W. to E., from N. to S., and from E. to W., by three magnificent streams, of which the two latter are navigable by heavily-laden boats for distances of from 200 to 300 m., whilst the former is derived from the remotest interior, being accessible for fully 700 m. along its own channel, and navigable also by large steamers for nearly 300 m. from the sea. The North and West Rivers join about 30 m. to the westward and northward of Canton, whence, in a noble channel of more than a mile broad, known as the Lower West River, or the Broadway, they pursue a direct southerly course to the sea. A portion of the united West and North Rivers is, however, diverted at the junction through a narrow channel in an easterly direction, and, after passing the important trading and manufacturing town of Fat-shan (Foo-shan), expands at Canton into the broad tidal river, branching into two channels (eventually subdivided into an intricate network around numberless flat, alluvial islands), which has the name of Chu-Kiang. 12 m. farther down the river is the safe and commodious anchorage of Whampoa, and 10 m. lower the East River joins, discharging itself by several mouths channelled through an alluvial plain. The bold shore a few miles lower down, and some rocky islets, compress the stream into a considerably narrower channel, called by the Chinese Hu Mun, or Tiger's Mouth, and by the Portuguese Boca Tigris, and hence *The Bogue*. On leaving the Bogue, the river expands to a breadth of several miles, joining by numerous tortuous channels the waters of the Lower West River, until it is finally lost in the sea about 80 m. from Canton. The breadth of the estuary is fully 70 geographical miles. At the extreme eastern limit lies the island forming the British colony of Hong Kong, 40 m. to the westward of which, and close to the Broadway Channel, is the Portuguese settlement of Macao. The facilities offered to commerce by so extensive a river-system, and its accessibility from the sea, made Canton at a very early date the principal seaport of the empire. This distinction it retained despite the drawback it suffers by its distance from the rich producing districts of Central *C.* The opening of new ports to the foreign trade was very prejudicial to the prosperity of Canton. The teas and other exports which were formerly brought by a land journey of 600 m. from the producing districts of Hu-peh across the mountains, and down the North River to the Canton market, were now purchased at Hankow, in the centre of the producing districts, and despatched by steamers navigating the Yang-tse to Shanghai, whence they were shipped to America and England direct. Imports, in like manner, were introduced at half a dozen eligible points to the markets of the interior. Hong Kong, too, in 1854, suddenly rose in importance, owing to the prevalence of the rebellion around Canton, which caused many of the native traders to seek security in Hong Kong, either as residents or by transporting merchandise thence in steamers to Canton. Two years later the entire foreign community was removed from Canton, owing to the pending hostilities with England, and a large accession to the importance of Hong Kong as a settlement was the natural consequence. The proximity of the English colony to the seat of trade gave encouragement to merchants to maintain their depots and residences in the island, inducing the Chinese dealers to visit them there for the purchase of imports. For the introduction of these into the interior, exceptional facilities were afforded by the numerous branches of the Canton River, through which merchandise, and especially opium, can be clandestinely conveyed, and the payment of customs duties at Canton avoided. Under these circumstances Hong Kong grew rapidly at the expense of Canton; and when tranquillity was restored, it became apparent, after a year or two, that the great mercantile houses need no longer make the latter place their head quarters. The number of foreign residents has dwindled year by year in pro-

portion to the growth of Hong Kong, whilst the introduction of powerful river steamers built in the U. States, and making the voyage between Canton and Hong Kong daily in less than six hours, has rendered it still more easy for the Chinese dealers to visit the colony and supply their wants from the importers there in the cheapest and most expeditious manner. In consequence of this revolution in the method of conducting trade, many of the principal firms have withdrawn altogether from Canton, whilst others are still represented by assistants employed for the purchase of tea and silk; but a large and increasing proportion of the trade has passed into the hands of commission agents, whilst the Chinese themselves are learning very rapidly to do business on their own account, or through the medium of the foreign commission agencies, thus progressively curtailing the importance of those few celebrated houses which once drew to themselves all but a fractional part of the entire outward and inward trade. Rapidity of intercommunication, the employment of steam, the extended use of the English language, and the vast influx of competitors from all parts of the world, are rapidly reducing the power of capital to a level with that of energy and enterprise, native as well as foreign; but with the more uniform distribution of the advantages of trade are entailed the evils of commercial insecurity and unsettled markets, with the attendant calamities of periodical failure and panics. Although Canton is situated nearly in the same parallel of latitude as Calcutta, there is a considerable difference in their temperature; the former being much cooler, and requiring fires during the winter months. The streets are very narrow, paved with little round stones, and flagged close to the sides of the houses. The front of every house is a shop, and those of particular streets are laid out for the supply of strangers. China Street is appropriated to Europeans; and here the productions of almost every part of the globe are to be found. One of the shop-keepers is always to be found sitting on the counter, writing with a camel's-hair brush, or calculating with his swanpan, on which instrument a Chinese will perform operations in numbers with as much celerity as the most expert European arithmetician. The Chinese, considered as traders, are eminently active, persevering, and intelligent. They are, in fact, a highly commercial people; and the notion that was once very generally entertained, of their being peculiarly characterized by a contempt of commerce and of strangers, is as utterly unfounded as any notion can possibly be. Business is transacted at Canton with great despatch; and nowhere in the world may cargoes be sold and bought, loaded and unloaded, with more business-like speed and activity. Provisions and refreshments of all sorts are abundant in Canton, and, in general, of an excellent quality; nor is the price exorbitant. Every description of them, dead and alive, is sold by weight. It is a curious fact that the Chinese make no use of milk, either in its liquid state, or in the shape of curds, butter, or cheese. Among the delicacies of a Chinese market are to be seen horse-flesh, dogs, cats, hawks, and owls. The country is well supplied with fish from the numerous canals and rivers by which it is intersected. Steamers of heavy burden can ascend the river to an anchorage immediately facing the Shamien Site; and, although the limits of the port of Canton are officially held not to extend above the anchorage of Whampoa, the advantage to trade which is entailed by the loading and discharging of steamers at Canton is so great, that a tacit permission is given to the practice. Several large steamers trade regularly between Canton, Shanghai, and Tien-tsin, carrying almost exclusively native merchandise, such as drugs, dried fruits, iron and brass ware, paper (of which large quantities are manufactured near Canton from the macerated hull of the bamboo), etc. It is rarely that foreign traders are concerned in these shipments. The great staples of tea and silk, opium and cotton goods, may still be said to occupy almost exclusively the attention of foreign merchants. German and French houses do, indeed, import some quantities of petty European manufactures, among which watches and fire-arms take the lead; but the importance of this trade is not great. Among the articles of the second class to be enumerated are matting and fire-crackers (largely shipped to the U. States), and drugs. Pop., 1,200,000.

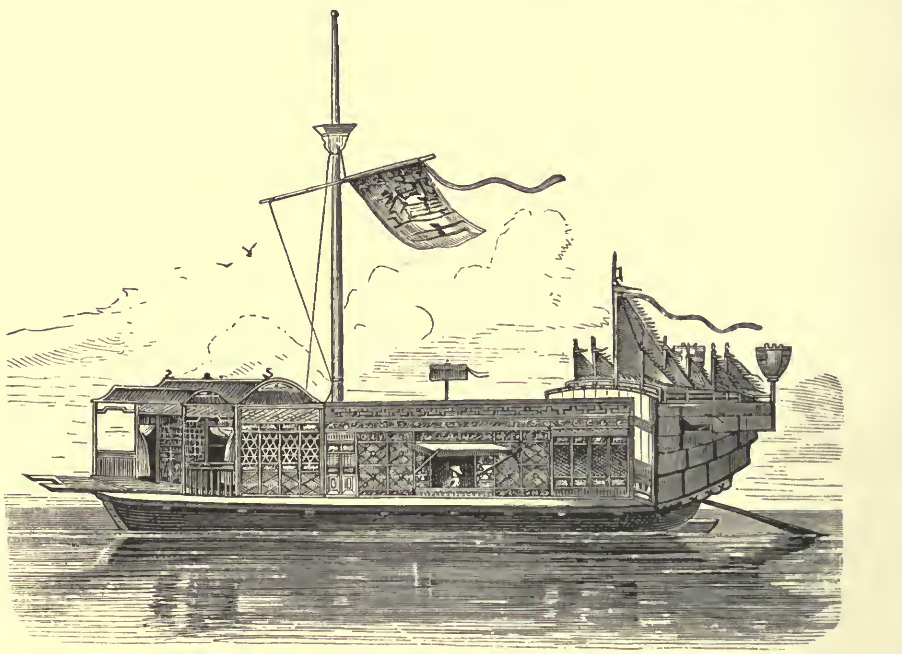


Fig. 74. — Mandarin's Boat.

Foo-chow, the capital of prov. Foo-keen, is one of the principal Treaty ports. It lies on the river Min, 34 m. from its mouth in the Formosa Channel, in lat. 26° 2′ 24″ N., and lon. 119° 25′ E., 185 m. from Amoy, 335 from Swatow, 410 from Shanghai, and 510 from Hong Kong. The navigation of the estuary of the Min is intricate and dangerous, the guide to the transit being the prominent landmark called Sharp Island Peak. At about 8 m. from the mouth the stream contracts to a channel not more than half a mile in width, at the passes of Kin-pai and Minguan. Above these passes is the anchorage for foreign vessels at Lo-sing Island, called also Pagoda Island. Vessels are held to have entered the port when they have passed Kin-pai, and the shipment and discharge of cargo take place at Pagoda Island, Kushan, and the river between the bridge and Tien-how Island. The shallowness of the river above Pagoda Island, about 10 m. from Foo-chow, precludes the passage of any but very light craft. The principal exports are of tea, of which about 75,000,000 lbs are annually exported. The qualities are Oolong to the U. States, and Congou and Souchong to England. The local weights are one third less than those employed elsewhere. Thus the Foo-chow catty is nearly equal to the lb. avoirdupois. The payments are reckoned in Sycee, cut dollars being 13.2 per cent discount, clean Mexican 12 per cent. There is a dock at Pagoda anchorage, 300 feet long, 95 broad, and 22 deep, which is owned and managed by Europeans. Pop. 800,000.

Hankow, one of the five chief commercial cities in the empire, and the most important among the river ports in C. opened to foreign trade, in lat. 30° 32′ 51″ N., lon. 114° 19′ 55″ E.; 582 geographical miles from Shanghai. It faces Hanyang city, across the Han, and Woo-chang across the Yangtze.

It is nearly in the centre of *C.*, at the junction of the Han and Yangtze, and commands the most extensive river communication in the world. The depth of the river at the mouth of the Han is 11 fathoms in Dec., and much more in July. The export trade consists chiefly in tea, silk, wool, oil, tobacco, and vegetable tallow, and amounts in value to about 15,000,000 taels annually. Most of the tea is transshipped at Shanghai, but some is loaded at Hankow for America and England direct. The imports are chiefly cotton piece goods, woollens, silk, and sugar. The trade with this port is said to be seriously hindered by the practice of affording long credits to the native buyers of imports. The navigation of the Yangtze is difficult and somewhat dangerous. Pop. 600,000.

Kiu-kiang, a river port on the right bank of the Kiang-se, and close to the outfall into that river of the waters of the So-yang lake, 137 m. by land from Hankow. Tea is the principal export. The chief imports are textile fabrics and opium. The foreign inhabitants are not numerous, and trade has not increased according to expectation. In 1877 the value of imports in foreign vessels was $19,676,500, and of the exports $15,770,-476. Pop. 40,000.

Newchwang, the most northerly of the Treaty ports, in the Manchurian prov. of Shing-king, on the river Liaou, lat. 41° N., lon. 122° 30′ E., at 35 m. from Moukden. The trade, which is rapidly increasing, is mostly confined to Shangay and Swatow. Navigation is closed 3 months of the year by ice. The imports consist chiefly of opium, sugar, and cotton goods. The import of cotton goods for the year ending June 30, 1878, consisted of 974,387 pieces, against 769,468 in 1877. The increase was notably on American drills, of which 200,000 pieces were imported, against 79,000 during the preceding year, and American and English sheetings. Of iron, bar and nail-rod, 11,294,705 tons were imported in 1878, against 4,965,466 tons in 1877. There was also an increased demand for lead. 360 vessels of 152,009 tons cleared the port in 1878, against 286 vessels of 106,289 tons in 1877.

Ningpo, in the prov. of Che-keang, on the river Yung, lat. 29° 55′ 12″ N., long. 121° 22′ E. The port commences at the river's mouth; three islets, called the Triangles or Yew Islands, forming three passages to the river. The port is 11 m. up the stream, which is about 600 yards wide at this point, with depths varying from 5 to 2 fathoms. Vessels of 17 feet draught can proceed to the city at half-tide in the spring. European pilots procured at Chin Hai. The access to the river Yung was facilitated by the construction of two lighthouses on the islands off its mouth. The first is built on Square Island, and is 186 feet above the sea-coast, lat. 29° 59′ 22″ N., long. 121° 45′ 6″ E. The second lighthouse, 154 feet above the sea level, is on Tiger's Island, about half a mile from the entrance of the river, lat. 29° 57′ 43″ N., long. 121° 43′ 51″ E. The chief exports are tea, silk, and cotton; the imports, textile fabrics, opium, and rice. In 1877 vessels of all nations entered 477, tons 268,643. There is a custom-house under foreign management. On the opposite side of the river is a foreign settlement, where the consuls reside, and from 30 to 40 foreigners carry on trade. Pop. 115,000.

Shanghai, or *Shanghae*, a seaport city, and the chief emporium now open for foreign commerce, in prov. Keang-soo, on the Wong-poo River, 160 m. E.S.E. of Nankin, and 12 m. above the mouth of the Wong-poo, in the estuary of the Yangtze. The Wong-poo, though three fourths of a mile broad, opposite Shanghai, with a depth of 3 or 4 fathoms, is little better than a mere tidal channel reaching 40 m. inland, and draining away the surplus waters from the interior chain of lakes. The land to the N. and E. of Shanghai has been formed within the last three centuries by the alluvium brought down the Yangtze. This process of deposition going on, the great city may, in course of time, find itself cut off from its communications with the sea, and the sources of its present prosperity dried up. Lat 31° 15′ N.; lon. 121° 28′ E. It stands on a level and highly cultivated plain, and is enclosed by a wall 5 m. in circuit, immediately outside of which are several populous suburbs. It is an important entrepot of the commerce between the N. and S. provs. of China, exporting manufactured goods to Tien-tsin, in the metropolitan prov. of Chih-le, and importing large quantities of pulse, flour, meats, rhubarb, and skins from the shores of the Yellow Sea. An extensive internal communication by water facilitates its trade with all the N. half of China, and it is stated to have a direct trade with the countries of Central Asia. Its coasting trade is also very extensive, and 3,000 junks are often crowded together in its river, many being from Hainan, Canton, and the Malay archipelago. This refers to the native city only, the foreign settlement being entirely distinct. It is situated outside the walls to the N. and E., on the left bank of the Wong-poo River, 3 m. long by 1 m. wide, and divided into the American, British, and French concessions. On the opposite bank is the Pootung suburb, where are large manufs. of machinery, and ship-building establishments. The river is here crowded with shipping from all parts of the world, the anchorage extending for 5 m. down, where from 250 to 300 sailing ships and steamers may be seen at anchor, some of the latter 2,500 tons burthen. The chief custom-house under foreign control in China is at this port, with a harbor-master and pilot board. There are fifteen consuls, the principal being British, American, and French. These have criminal jurisdiction over the subjects of their several nations, and the Chinese are amenable to the *Taoutai*, or chief magistrate of the city. There is also a foreign municipality for the construction and conservation of public works, with power to tax the natives; but beyond these there is no regular executive or legislative government. *Shanghai* has few products of its own; its importance arises from its position as a central emporium of N. China, and the country up the Yang-tse-Kiang. It has regular steam communication with all the open ports in China and Japan, and fortnightly with India and Europe. There are three daily newspapers, two weekly, and two fortnightly, published in the English language; and four three times a week in Chinese. Principal exports to foreign countries are silk, tea, cotton, cassia, camphor, and porcelain; and imports opium, specie, cotton and woollen goods, munitions of war, hardware, and general merchandise. In 1877, 1979 vessels of 211,316 tons entered, and 1,971 of 1,244,636 tons cleared the port. The annual export of tea to the U. States averages about 22,000,000 lbs. Pop. 400,000.

Swatow, or *Chan-chou*, in prov. Kwang-tung, on the left bank of the river Han and 5 m. from its mouth, 22 m. E.N.E. of Canton. Its foreign trade is considerable. 809 vessels of 391,600 tons, of all nations, cleared the port in 1877. The value of imports for that year, consisting chiefly of bean-cake, opium, cotton piece goods, and woollen goods, was $8,872,400.

Tien-tsin, in the metropolitan prov. of Chih-le, in which is situated Peking, the cap. of the empire. It is situated at the junction of the rivers Wan-ho and Peiro, which flow into the Gulf of Pih-chih-li, lat. 39° N., lon. 118° E. Two miles below the city is the "concession," or quarter for foreigners. The U. States, together with almost every European nation, is here represented by a consul. It is a great entrepôt for salt. The trade of the city has for several years been going over in great part into the hands of the Chinese merchants, who, by going to Shanghai and purchasing for themselves and shipping direct, are in a position to undersell the foreign merchant at Tien-tsin. The port is closed three months of each year (Dec. to March) by ice, but during this time sledges supply the place of junks on the river, and commercial activity does not flag. In 1877, 712 vessels, of 288,348 tons, entered and cleared. The imports consist chiefly of gray and white shirtings, T-cloths, Turkey-red cambrics, camlets, and opium.

Finances. — The amount of the public revenue of China is only known by estimates. According to the most authentic of these, the total receipts of the government in recent years averaged $125,000,000, derived from taxes on land, grain, licenses, and customs duties upon exports and imports. The receipts from customs alone are made known. They amounted to 7,872,257 haikwan tael, or $11,783,385, in 1864, and, gradually increasing, had risen to 12,152,921 haikwan tael, or $18,229,380, in 1876. The customs duties fall more upon exports than imports. The expenditure of the government is mainly for the army; the maintenance is estimated to cost $75,000,000 per annum on the average. *C.* had no foreign debt till the end of 1874. In Dec., 1874, the government contracted a loan of $3,138,375, bearing 8 per cent interest, secured by the customs revenue. A second 8 per cent foreign loan, likewise secured on the customs, to the amount of $8,021,880, was issued in July, 1878.

Money. — The Chinese have no silver coin, and keep their accounts in taels, mace, candareens, and cash, forming a decimal system, of which only the lowest member is represented by a coin. Weight of silver is, indeed, the basis of their notation in this respect. A tael or *liang* equals 1⅓ oz. of silver, and is divided into 10 mace (*tsien*), the mace into 10 candareens (*fun*), and the candareen into 10 *li*, to which 1 cash in copper should precisely correspond. Owing, however, to the decline in the value of the *cash*, which for nearly half a century has undergone progressive depreciation in the mintage, the average value of the tael is 1,400 copper cash (*t'ung-ts'ien*). These coins are cast in moulds, with a square hole occupying the centre, around which, on the obverse, are Chinese characters, denoting the reign, with the words "Circulating Value," and on the reverse the name of the mint in Mantchoo characters. In large native transactions, pure silver, known as *Sycee*, is the basis of exchange. The silver is cast in ingots, called *shoes*, from a fancied resemblance in shape; these weigh from ½ a tael to 100 taels. Silver of the highest standard of purity is produced at the Customs Bank by melting and refining the foreign coin received in payment of duties, and is known as Hai-kwan (i. e. customs) Sycee. The Hai-kwan Tael = $1.61.

The *fineness of gold and silver* is expressed by dividing the weight into 100 parts, called *toques*, or touch, similar to the French practice. Thus, if an ingot be 93 touch, it is understood to contain 7 parts of alloy and 93 of pure metal, making in the whole 100. The fineness of the precious metals, expressed in these decimal proportions, may be converted into English proportions by the following analogies. Suppose gold is 91.66 touch, say, as 100 : 91.66 : : 12 : 11, the standard, and *vice versa*; and to convert standard silver into touch, say, as 240 : 222 : : 100 : 92.5, the touch of sterling silver. — *Gold* is not considered as money, but as merchandise; it is sold in regular ingots of a determined weight; the largest of these weigh 10 taels each; and the gold is reckoned 94 touch, though it may be only 92 or 93.

Table for converting Chinese Money Weight into English Troy Weight.

Taels	oz.	dwts	grs.	Mace.	oz.	dwts.	grs
100	120	16	0	8	0	19	7.872
50	60	8	0	7	0	16	21.888
25	30	4	0	6	0	14	11.904
24	28	19	20.16	5	0	12	1 920
23	27	15	16.32	4	0	9	15.936
22	26	11	12.48	3	0	7	5.952
21	25	7	8.64	2	0	4	19 968
20	24	3	4.80	1 or 10			
19	22	19	0.96	Candar.	0	2	9.984
18	21	14	21 12	9	0	2	4 1856
17	20	10	17 28	8	0	1	22.3872
16	19	6	13 44	7	0	1	16.5888
15	18	2	9 60	6	0	1	10.7904
14	16	18	5 76	5	0	1	4.9920
13	15	14	1 92	4	0	0	23.1936
12	14	9	22.08	3	0	0	17.3952
11	13	5	18 24	2	0	0	11 5968
10	12	1	14.40	1	0	0	5.7984
9	10	17	10.56	Cash.			
8	9	13	6.72	9	0	0	5 21856
7	8	9	2 88	8	0	0	4 63872
6	7	4	23.04	7	0	0	4.05888
5	6	0	19 20	6	0	0	3 47904
4	4	16	15 36	5	0	0	2.89920
3	3	12	11.52	4	0	0	2.31936
2	2	8	7.68	3	0	0	1.73952
1	1	4	3.84	2	0	0	1.15968
Macc.				1	0	0	0 57984
9	1	1	17 856				

Weights and Measures. — Gold and silver are weighed by the catty of 16 taels; the tael is divided into 10 mace, 100 candareens, or 1,000 cash. 100 taels are reckoned to weigh 120 oz 16 dwt troy, which makes the tael equal to 579.8 English grains, or 37.566 grammes The weights and measures in ordinary use for merchandise at the treaty ports, and in the intercourse with foreigners, are as follows: —

The	*Leang*, or *Tael*	= 1⅓ oz avoirdupois.
"	*Picul*	= 133 lbs. "
"	*Catty*	= 1⅓ " "
"	*Chih*	= 14.1 inches.
"	*Chang*	= 11¾ feet.
"	*Lys*, or *Li*	= 194 to a degree, or about ⅓ Eng. mile.

In the tariff settled by treaty between Great Britain, America, and China, the *Chih* of 14.1 English inches has been adopted as the legal standard. It is the only authorized measure of length at all the ports of trade, and its use is gradually spreading all over the empire.

Banking — The following lines on the course of banking with *C.* which may be pursued, may be of interest to many American merchants who seek to extend their business relations in this direction, — say goods from New York to Shanghai. If no advance is required in New York, shippers may send to one of the Chinese agencies of a London bank (the Oriental Bank Corporation for instance) the bills of lading authorizing delivery against payment. The usual charge for collecting and remitting in this way is one half per cent. In case the above instanced bank was employed, the best form of remittance would be its six months' sight draft on the Union Bank of London, which could be discounted there if required. If money is wanted in New York at time of shipment, a credit on London could be arranged, the charges for this credit being a question for the London head office, — probably 1½ per cent. The shipping documents may then be sent to Shanghai bank agents direct by the banker negotiating in New York, or they can accompany the draft, and be sent on from London. On receipt of payment, or partial payment, of any amount, the Shanghai bank would remit by sight draft, which would go against the New York draft and any interest due. The interest would not be much, if any, less than 6 per cent per annum, and more when the Bank of England rate was over 6 per cent, and may be chargeable from date of maturity of the New York draft till due date of China remittance. If the goods are shipped to a port in China where the London bank has no agent, its Shanghai branch will constitute an agent or agents for the time being, who would be entitled to charge a commission on their own account in addition to the one half per cent charged by the bank.

Chinese Immigration. — Important among the proceedings of the Chamber of Commerce of New York, affecting the international relations of the U. States, was its action, in Feb. 1879, upon the bill passed by both Houses of Congress, and, fortunately for the credit of the nation, vetoed by the President, restricting Chinese immigration to the U. States. The subject was presented by Mr. A A. Low, whose life-long connection with the Chinese trade give to his opinions peculiar weight. He called attention to the fact, that, in any attempt of such exclusiveness, we were but repeating the traditional policy of non-intercourse of the Celestial Empire itself, which has been altered with so much difficulty, and he gave warning that *C.* might well retaliate by putting an end to the treaty of amity, commerce, and navigation now existing between the Empire and the Republic. He concluded with an earnest appeal to the President to withhold his sanction from the bill as unworthy of the country. Mr. William H. Fogg, also one of the oldest merchants in the trade with *C.*, followed in support of the arguments presented. He pointed to the fact, that we are just entering upon a new era in our relations with the Celestial Empire, and showed the folly of our giving just cause of offence to this sensitive people at the precise moment when their secular prejudices are beginning to yield to the pressure of civilization from without. Mr. Elliot C Cowdin then addressed the Chamber as follows: — "What is the cause of the extraordinary action of our national legislators in regard to our hitherto much vaunted treaties with the Chinese government? California has come to Congress with three special complaints with regard to the Chinese, and these complaints have proved sufficient to excite, and I might almost say to frighten, a nation of well-nigh fifty millions of people, into a proceeding unprecedented in its history. These complaints are: 1st. That the Chinese are coming to this country in overwhelming numbers, and, by an unfair competition with white labor, are driving it from the field. 2d That this enormous immigration is not voluntary, but that these Chinamen are, in reality, a servile class. 3d. That their vices make them a demoralizing and destructive element in a community. Now, what are the facts? As to the enormous immigration, the official records of the San Francisco Custom-House show that of all the Chinese who had arrived in California for the twenty years ended July 1st, 1868, nearly three eighths had returned to China, and that the total number remaining at that time on the Pacific coast was less than 65,000. Since that time the reports of the U. States Bureau of Statistics indicate that not more than 48,000, at a liberal estimate, have been added to that number, if we allow the same percentage as in previous years for their returning. According to these figures, it is difficult to see how there can be, on the whole Pacific slope, more than about 130,000 Chinese scattered through all the States and Territories of that vast region. As to the number in California itself, so late an authority as the *Sacramento Union*, of the 15th of the present month, estimates it at not more than 60,000. Are these numbers now increasing? Far from it. On the contrary, the recently published record of arrivals and departures for the last six months in 1878 shows that during that period 4,646 Chinese sailed from California, while only 1,955 arrived there. So much for the overwhelming volume of Chinese immigration! As to the allegation that these Chinamen are creating an unfair competition especially detrimental to white labor, let us see what they have done The State records of California show that the Chinese, so early as 1861, paid in taxes, licenses, water rates for mining, the purchase of native products, and in other ways directly beneficial to the country, upwards of $13,000,000 in a single year An excellent authority estimated that in 1867 this sum had increased to $18,000,000, being $45 to each one of the white population of the State, estimating that population at 400,000. Can such a sum pass into the general business of a State without greatly benefiting its industrial classes? What sane man, who is annually relieved of $45 of taxation, can accuse the people who have done this of burdening the community? Let us now look at the question as to the voluntary character of their immigration. Mr. George F Seward, our present Minister to *C.*, and for more than ten years Consul and Consul-General in that Empire, has written explicitly, 'This emigration has been entirely voluntary in its character.' Dr. S. Wells Williams, for more than twenty years our Secretary of Legation, and repeatedly Acting Minister to China, says: 'They come and go from their own shores just as freely as Americans do from theirs' Further authority is certainly unnecessary, yet this high testimony can be confirmed by the report of almost every official who has investigated the subject. With regard to the charge, that the vices of the Chinese make them a dangerous class, we have the testimony of the Californians themselves, given at a time when politics had not entered into this question. In 1862, a Joint Select Committee of the California Legislature made a report in which these passages occur: 'It is charged that the Chinese demoralize the whites. We cannot find any ground for the allegation. We adopt none of their habits, form no social relations with them, but keep them separate and apart, a distinct, inferior race. They work for us; they help us build up our State by contributing largely to our taxes, to our shipping, farming, and mechanical interests, without, to any extent, entering these departments as competitors. They are denied privileges equal with other foreigners; they cannot vote, nor testify in courts of justice, nor have any voice in making our laws, nor mingle with us in social life. Certainly we have nothing to fear from a race so contemned and restricted.' These facts should be accepted as a conclusive answer to this charge. With regard to the specific accusation that the Chinese women are brought here solely for immoral purposes, the report just quoted says that this practice 'is as abhorrent to their respectable merchants as it is to us.' And in a memorial addressed to the President in 1876, by the *Six Chinese Companies of San Francisco*, these merchants state the case as follows: 'A few years ago our

Chinese merchants tried to send these prostitutes back to C., and succeeded in getting a large number on board the outgoing steamer; but a certain lawyer of your honorable nation (said to be the author and bearer of these resolutions against our people), in the employ of unprincipled Chinamen, procured a writ of *habeas corpus*, and brought all these women on shore again; and the court decided that they had a right to stay in this country if they so desired.' The extent of this evil, abhorrent as it is, is greatly over-estimated. According to the Annual Report of the Bureau of Statistics, the whole number of Chinese women who came to this country during the fiscal year 1877 was only 76. These are some of the grounds on which Congress has hastily decided to reverse the established policy of the government, and abruptly break the faith of the nation, as solemnly pledged in the Burlingame Treaty of 1868. . . . As a member of this Chamber, not less than as a life-long friend of the lamented Burlingame, I should be recreant to my duty did I not enter a solemn protest against an act of injustice so monstrous, that I cannot believe it will meet with Executive approval." Other speeches were made in the same direction, and a memorial to the President was unanimously adopted by the Chamber. See HONG-KONG.

China, China-ware. See PORCELAIN.

China Blue, a pigment consisting of oxide of cobalt, melted with felspar and potash. It is chiefly used to paint pottery-ware.

China-Blue Style, a mode of calico-printing, in which indigo-blues are printed on the cloth, and fixed by baths of salts of iron and of alkali.

China-Clay, decomposed felspar of the granite, a fine potter's clay largely used in ceramic manufactures. See CLAY.

China Crape, Canton Crape, a very fine kind of crape.

China Goods, a commercial name for all goods imported from the Chinese ports, whether of native or foreign origin.

China-Grass Cloth, a beautiful fine fabric made from the fibre of an Indian nettle, *Boehmeria nivea*, imported in this country as handkerchiefs. The finest kind is made from the fibre of several species of the genus *Sida*, and are imported from China, where they are called *hia pu* (*i. e.* summer cloth).

China-Ink. See INK.

China-Matting. See MATTING.

China-Merchant is a merchant whose business is exclusively in Chinese goods directly imported by him. — *China-Dealer* is one who keeps glass, earthen-ware, porcelain, and pottery for sale.

China-Orange, the sweet orange, *Citrus aurantium*, so named from the plant having been received originally from China.

China-Root, a large tuberose knotty root, of a dark reddish-brown color on the outside and reddish-white within, produced by *Smilax China*. It was formerly much used in medicine, but is now seldom imported. *Imp.* free.

China-Wine, a Chinese liquor, made from rice distilled with various fruits and vegetable substances to give it flavor. It contains from 25 to 28 per cent of alcohol, and is sometimes imported from Hong-Kong to San Francisco.

Chinchew, a name in China for sugar-candy.

Chinchilla, a little rodent animal, *Chinchilla lanigera*, which is about 6 inches in length from the nose to the root of the tail, with small pointed ears, a short muzzle, teeth like the house-rat, and a tail of moderate length. It lives in burrows under ground, in the open country, in the northern prov. of Chili. The *C.* is celebrated for the beauty of its fur, which exceeds in warmth and softness that of any other animal, and has been long known as an expensive and useful article in the dress of ladies.

Chine, a piece of meat cut near the back-bone of an animal. — The ridge of a cask where the ends of the staves are united. — The part of the waterway of a ship left above the deck.

Chiné, goods of worsted, cotton, silk, and linen, with printed warps.

Chineing-Machine, in coopering, is a machine used to chamfer the ends of staves on the inner surface, and form the chine.

Chinese Balance, a form of the *steelyard*, having four points of suspension, and as many graduated sides to the weight-arm of the lever. See STEELYARD.

Chinese Beer, a fermented drink made by the Chinese, from barley or wheat, with a bitter added to the wort.

Chinese Crackers. See FIRE-CRACKERS.

Chinese Sugar-Cane. See SORGHUM.

Chinese Varnish. See VARNISH.

Chinese Wax, the produce of an insect of the cochineal tribe, analogous in its chemical constitution to spermaceti. It is much valued by the Chinese.

Chinese Yellow, a color obtained from a very bright sulphuret of arsenic brought from China.

Chingkei, the Malay name for cloves.

Chingle, small coal.

Chink, a vulgar name for cash or money.

Chinois [Fr.], a small unripe orange, preserved in sugared brandy.

Chinsing, a temporary calking or stopping of the seams of a ship's deck or sides with oakum, which is thrust in with a small iron.

Chin-Strap, in saddlery, a strap connecting the throat-strap and nose-band of a halter.

Chintz [Fr. *indiennes*; Ger. *Zitze*; It. *indiane*; Port. *chitas*; Sp. *chites, zaraza*], a peculiar style of fast-printed calico, in which figures of many different colors are impressed upon a white or light-colored ground. Chintzes often possess great beauty of design and richness of color.

Chintz-Pattern, anything having a running or fancy pattern of divers colors, as cottons, paper-hangings, etc.

Chintz-Printer, one who forms or stamps chintz patterns or prints.

Chinum, a weight in Mysore of 8 grains.

Chip, a small slip or thin cutting of wood. — A kind of straw plait, the leaves of *Thrinax argentea*, a Cuban palm prepared for hats.

Chip Bonnet, a lady's bonnet made of fancy straw plait, or palm leaves.

Chip Flats are flats made of chip plaiting. They come from Italy or France, where they are prepared for the market.

Chip Platting, prepared and twisted thin chips of the wood of the willow, used for hats and bonnets. They come from Carpi, Italy.

Chiragon, a writing frame for the blind.

Chiretta, the Indian name of the *Agathotes chirayta*; all the parts of the plant are extremely bitter, and highly esteemed as a tonic and febrifuge.

Chirish, a mucilaginous liquor used by the weaver in the East for saturating his yarn, said to be procured from the root of a plant of the Asphodel family.

Chirk, a name for chert-stone or horn-stone, used for making the grinding stones of pottery-mills.

Chirogymnaste, a square board with contrivances for exercising the fingers of a pianist; an instrument of a similar kind for guiding the hands of a piano-forte player is called a *Chiroplaste*.

Chiropodist, one who removes corns, and attends to callosities of the feet.

Chisel, a mechanic's sharp cutting tool for shaping or gouging wood and stone, of which there are many kinds; as firmer chisels, coach maker's chisels, mill-wright's chisels, long paring chisels, rip-

ping chisels, blunt chisels, best mortise chisels, sash chisels, mortise-lock chisels, socket chisels, etc.; cold chisels are stouter tools of steel, for cutting iron, etc.

Chiselled-Work, wood or stone shaped with the chisel; sculptured work.

Chiselling, the process of shaping a block of stone by a sculptor or stone-worker. — A slang name for cheating.

Chit. See CHITTHI.

Chitak, Chittack, the lowest denomination of the gross Indian weights; the 16th part of the seer, and equal to 1 oz. 17 dwts. and 12 grains troy; a land measure of 45 square feet, the 16th of the cottah; the fifth part of the koonkee, a small grain measure weighing about 2 oz.

Chitarah, a cotton and silk stuff made in Turkey.

Chite, a kind of Spanish cotton stuff.

Chitterlings, Chitlings, parts of the smaller intestines of some animals, cleansed and prepared for food.

Chitthi, Chittie, ordinarily abbreviated to chit, a common Indian name for a bill, bond, draft, or order for payment, note, etc.

Chives, an alliaceous plant, *Allium schœnoprasum*, the leaves and young tops of which are used as a pot-herb.

Chlorate of Potash, an interesting compound of chloric acid and potash, which, when strongly triturated, crackles, throws out sparks, and becomes luminous. It forms an ingredient of the composition for tipping lucifer-matches, is used for bleaching fats and oils, and has been recently introduced into medicine as a tonic and valuable remedy for nervous complaints.

Chloride of Lime. See BLEACHING-POWDER.

Chlorimetry is the process of estimating the proportion of available chlorine in bleaching-powder, which may vary from 20 to 36 per cent.

The process depends upon the great power with which chlorine, in the act of being liberated from its compounds, causes the oxidation of many substances. The salt generally used is pure crystallized sulphate of iron, which in its ordinary state gives a deep blue color, with a drop of ferridcyanide of potassium, but ceases to do so when it has been fully oxidized, or converted from a proto-salt into a per-salt, through the influence of chlorine. It being known that 78 grains or parts of sulphate of iron are oxidized by 10 grains or parts of chlorine, the mode of procedure in *C.* is as follows: — 78 grains of fine crystals of the sulphate of iron are dissolved in water slightly acidulated with hydrochloric acid in a white porcelain basin. A given quantity of the bleaching powder — say 50 grains — is dissolved in a little tepid water, and introduced into a tall measure-glass called a *chlorimeter* or burette (Fig. 75), similar to an alkalimeter, which is divided into 100 parts, and water added till the solution rises to the top mark. After subsidence of the insoluble matter, the clear solution is very gradually poured into the solution of sulphate of iron in the basin, the whole being kept constantly stirred, and every now and again a drop of the iron solution is taken out and placed on a new drop of ferridcyanide of potassium placed on a white plate; and whenever the iron solution ceases to produce a deep blue, and only forms a light greenish-yellow tint, it is known that the iron has been fully oxidized by the chlorine. Suppose that at this stage the burette has been emptied to the 55th division; as we know that the liquid poured out must have contained 10 grains of chlorine, we can calculate the chlorine contained in the whole; for

55 : 10 : : 100 : 18.18.

Thus 50 grains of the powder contain 18.18 grains of chlorine, or 36.36 per cent.

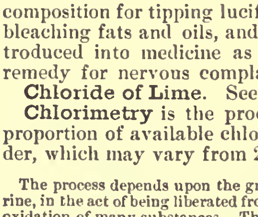


Fig. 75. — CHLORIMETERS.

Chlorine, a gas possessing a yellowish-green color, and a pungent, suffocating odor. It is a non-metallic element, and one of the heaviest substances that are gaseous at ordinary temperatures, being nearly $2\frac{1}{2}$ heavier than atmospheric air; sp. gr. 1.47. It is soluble to a considerable extent in water, that liquid at 60° F. absorbing about twice its volume. It is non-inflammable, but its union with some of the elements is attended with the phenomena of combustion: thus, phosphorus, copper leaf, powdered antimony and arsenic, and several other substances, thrown into chlorine, immediately inflame. Under a pressure of 4 atmospheres it is condensed into a yellow, limpid liquid. Moist *C.* gas cooled to 32° F. condenses into yellow crystals, containing $35\frac{1}{2}$ parts of chlorine and 90 parts of water. The most remarkable property of chlorine is its power of destroying almost all vegetable and animal colors, and the putrid odor of decomposing organic matter; hence its value as a bleaching agent, and as a disinfectant and fumigator. When first proposed as a bleaching agent by Berthollet, it was used much the same way as sulphur is now in bleaching woollen goods; afterwards a solution of the gas in water was employed, but the final improvement was Tennant's patent of combining the gas with lime to form *chloride of lime*. With the bases chlorine forms an important series of compounds called chlorides. — Free *C.* is readily distinguished from other gases by its color, suffocating odor, and bleaching properties. The aqueous solution dissolves gold-leaf, and with nitrate of silver gives a white, curdy precipitate.

Chloroform is a highly limpid, mobile, colorless liquid, which is very volatile, has a characteristic and pleasant odor, and an agreeable sweetish taste. Sp. gr. 1.48; boiling point, 140° F. It is not inflammable in the ordinary sense of the term, as it will not take fire when a light is brought down upon it; but when thrown on red-hot coals, it burns with a green flame, evolving much smoke. It is slightly soluble in water, but more readily mixes with alcohol and ether. The vapor has the remarkable property of rendering a person breathing it temporarily insensible to pain. It dissolves camphor, amber, copal, and other resins, wax, caoutchouc, black and red sealing-wax, iodine and bromine, as well as strychnine and other alkaloids. Its purity may be determined by placing some on the palm of the hand, and allowing it to evaporate, when no alcoholic or other odorous substance should be even momentarily recognized; and by agitation with oil of vitriol, when, on settling, the *C.* should readily swim on the surface of the vitriol, and the two layers of liquid remain colorless. *C.* is anodyne, antispasmodic, sedative, stimulant, and anæsthetic. In small doses (5 to 12 or 15 drops, in water, mixed with a little syrup or mucilage) it is employed in spasmodic disorders, and as a stimulant and diaphoretic. It is however chiefly used as an anæsthetic to produce insensibilty to pain during surgical operations. The dose for inhalation is 1 fluid dr., which is repeated, in a few minutes, if no effect is produced, until 3 fluid dr. have been thus exhibited; the effects being carefully watched, and the source of the chloroform vapor removed as soon as a sufficient degree of anæsthesia is produced, or any unpleasant symptoms develop themselves. *C.* in large doses depresses the heart's action, and causes profound coma, and death. It is therefore dangerous in all cases com-

plicated with diseases of the heart or brain, or any visceral affections of a congestive character. The average price of *C.* in New York is for American *C.* $0.80, for Scotch *C.* $3.60 per lb. *Imp.* duty, $1.00 per lb.

The remarkable anæsthetic power of *C.* has led to its preparation on a very extensive scale. The materials employed are alcohol, water, and bleaching powder, and the proportions are four parts of bleaching powder, to which sufficient water is added to make a thin paste, and thereafter one part of spirits of wine; the whole is introduced into a capacious retort, which must not be more than half filled, and, heat being applied, the *C.* accompanied by water and a little alcohol, distils over. As the *C.* is heavier than water, and is not readily miscible therewith, two layers of liquid are obtained in the receiver, — the upper being water and alcohol, and the lower being chloroform. The upper liquid being cautiously poured off, the *C.* is agitated with fused carbonate of potash, which abstracts the remaining traces of water, and on subsequent redistillation the *C.* is obtained pure and ready for use.

Chlorometer or **Chlorimeter**. See CHLORIMETRY.

Choca, a mixture of coffee and chocolate.

Chock, Chuck, a piece of wood for stopping or raising anything.

Chock and Block, a nautical and mining term, signifying closely wedged, or tightly filled up.

Chock-Full, Choke-Full, anything quite full, and into which no more can be put.

Chocolate [Fr. *chocolat;* Ger. *Schokolade;* It. *cioccolata;* Port. and Sp. *chocolate*], a beverage or paste made from the roasted seeds of the *Theobroma cacao*, or cocoa (see CACAO). Strictly speaking, the term *C.* is applicable to all genuine preparations of cacao, but it is now generally used to distinguish those which contain sugar, and, commonly, flavoring substances. To prepare *C.* the cacao or cocoa nibs are ground in a mill consisting of stone or metal rollers, which are usually heated either by charcoal fires or by steam, so as to soften or melt the natural fat (Butter of Cacao). The warm, smooth paste which passes from the mill is then placed in a mixing mill, and incorporated with refined sugar, and usually vanilla or other flavoring substance. The trituration is continued until the whole paste is converted into an entirely homogeneous mass, which is finally shaped, by means of suitable moulds, into various forms, as blocks, loaves, tablets, lozenges, etc. *C.* prepared as above, without the addition of aromatics, is known in the trade as *plain C.* The Spaniards flavor it with vanilla, cloves, and cinnamon, and frequently scent it with musk and ambergris. With these additions it is termed *Spanish C.* In general, they add too large a quantity of the last four articles. The Parisians, on the contrary, use little flavoring, and that principally vanilla. They employ the best kinds of cocoa, and add a considerable quantity of refined sugar. So prepared, it is called *French C.* — *C.* is used as a beverage, and for this purpose is dissolved in hot water or milk. In a pure state it soon satisfies the appetite, and is very nourishing; when it contains spices, it is also stimulating. Good *C.* is externally smooth, firm, and shining, not gritty in the fracture, easily soluble, aromatic; not viscid after having been liquefied and cooled, but oily on the surface, and leaves no sediment of foreign substances. *C.* is adulterated in many ways, by mixing it with rice-meal, oat-meal, flour, potato starch, roasted hazel-nuts or almonds, and with benzoin, storax, etc., in place of vanilla. Simple cacao or cocoa is more generally used in this country than *C.* *Imp.* duty 5 cts. per lb; fancy, styled *bon-bon* or *C.* sweetmeats, 50 per cent.

Fig. 76 represents a *C.* mill. Upon the sole A, made of marble, six conical rollers B B are made to run by the revolution of the upright axle or shaft *g*, driven by the agency of the fly wheel E and level wheels I K. The sole A rests upon a strong iron plate, which is heated by a small stove, introduced at the door H. The wooden framework F forms a ledge, a few inches high, round the marble slab, to confine the cocoa in the act of trituration. C is the hopper of the mill through which the roasted beans are introduced to the action of the rollers, passing first into the flat vessel D, to be thence evenly distributed.

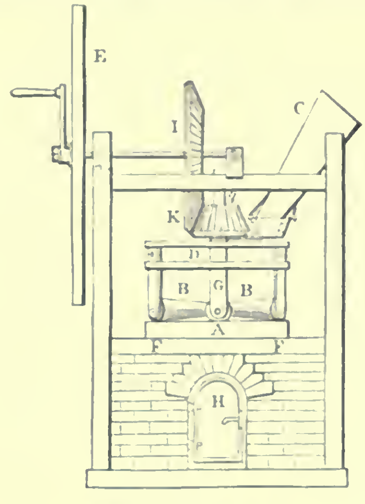


Fig. 76. — CHOCOLATE MILL.

After the cacao has received the first trituration, the paste is returned upon the slab, in order to be mixed with the proper quantity of sugar and vanilla, previously sliced and ground up with a little hard sugar. When the *C.* is sufficiently worked, and while it is thin with the heat and trituration, it must be put carefully into the proper moulds. If introduced too warm, it will be apt to become damp and dull on the surface; and if too cold, it will not take the proper form. It must be previously well kneaded with the hands to insure the expulsion of every air-bubble.

Chocolate Nut, a name given to the beans or seeds of *Theobroma cacao*. See CACAO.

Choka, a Hindustani name for rice.

Choke-Damp, a miner's name for carbonic acid and other dangerous gases.

Choleta, a kind of coarse linen or canvas.

Cholíah, or **Choolia**, a native coasting vessel on the Coromandel coast.

Chop, a trade name in China for the entire bulk of a certain kind of tea brought to market, or the quantity made, usually comprising 600 chests of Congou, but sometimes reaching 1,000 chests. In this country the term is also used to denote a special quality, trade-mark, or brand of tea, coffee, or other goods; as, tea of the first chop, i. e. of the first quality.

Chopper, an edge tool or small hatchet for domestic use.

Chopping-Block, a large solid block of wood, used by butchers and others to chop meat, etc. upon.

Chopping-Machine, a rotatory machine for mincing sausage-meat.

Chop-Sticks, small pieces of wood used by the Chinese to convey food to the mouth, in the place of the knife and fork or spoon of other nations.

Chorographer, one who lays down maps or plans descriptive of a country.

Chow, corrupted from Chaver or Chau, the nominal weight by which pearls are valued in India, the 6th part of the grain as a weight for silver. The Chow is nominally divided into 320

fractional parts. The term has also reference to the quality and value of the gem, ascertained by the size, color, and weight. See KALLINGEE and MARIJADY.

Chow-Chow, a Chinese word applied to any mixture; but in trade circles usually applied to mixed pickles.

Chowder, a soup made with fish.

Chowder-Beer, an infusion of black spruce in water sweetened with molasses, used by the fishermen of Newfoundland as an antiscorbutic.

Chowkee, a kind of cane chair made in India of rattans, the *Calamus rotang* and *arborescens*.

Christiania. See NORWAY.

Christian d'or, a Danish gold coin, worth about $2.54.

Christiansand. See NORWAY.

Christmas-Trees, small growing firs or artificial trees, sold to decorate with candies, fancy ornaments, etc., on festive occasions.

Christofia is a stomachic brandy or wine made of 1500 parts white wine, 20 parts cinnamon, 10 parts cloves, 60 parts bitter almonds, digested several days; 300 parts of sugar and 500 of spirit are then added, and the whole filtered.

Chromacome, for dyeing the hair black. This is said to be prepared from harmless vegetable materials, but really consists of pyrogallic acid and nitrate of silver.

Chromate. See CHROMIUM.

Chrome Green. See GREEN PIGMENTS.

Chrome Red. See RED PIGMENTS.

Chrome Yellow, the chromate of lead. See CHROMIUM.

Chromium, Chrome, a metal resembling iron in color, brittle, and difficult of fusion. Sp. gr. 5.9. It is rarely to be found in its metallic state, but several of its compounds are used in the arts. In commerce, it chiefly occurs in the forms of chromate of iron and chromate of lead.

Chromate of Iron, *Chrome Iron-ore*, is a compound of oxide of chrome with protoxide of iron. It is found in Shetland, in France, and in the U. States. It occurs massive, and in octahedral crystals of a blackish color and imperfect metallic lustre. Sp. gr. 4.3. It is used in the manuf. of chromate of potash.

Chromate of Lead, *Red Lead*, *Chrome-Yellow*, is found native in the gold mines of Berezof in Siberia, in the Ural Mountains, and in Brazil, and is easily prepared by mixing chromate of potash with a soluble salt of lead. It occurs massive and crystallized; color deep orange-red; when pulverized, orange-yellow. Sp. gr 6. It is a valuable pigment, and is used both in oil and water colors, in calico-printing, and in dyeing. *Imp.* duty 25 per cent.

Chromate of Potash is a salt of a bitter disagreeable taste; crystals yellow. Sp. gr. 2 6 The *Bi-chromate of Potash* is prepared from the chromate; it has a bitter, penetrating metallic taste. Sp. gr 1.98. This salt is largely manufactured in Glasgow, for the use of calico-printers. *Imp.* duty, 3 cts. per lb.

The other compounds chiefly in use are the *Oxide of Chromium*, employed to give a green color to glass and to porcelain, and *Chromic Acid*, which, from its property of destroying most vegetable and animal coloring-matters, is advantageously employed in calico-printing. *Imp.* duty of chromic acid, 15 per cent.

Chromo-Lithography. See LITHOGRAPHY.

Chromo-Typography. See PRINTING.

Chronograph, or **Time Indicator**, is a sort of clock which leaves a *visible* testimony to the lapse of intervals of time. In one form of the instrument an observer presses down a small key at the beginning of any astronomical observation, and another at the end. Two dots are thus made on a piece of paper coiled round a revolving cylinder; and clock-work connected with the cylinder enables the distance between the two dots to measure an extremely minute portion of time. A much simpler kind of chronograph has been invented by Mr. Benson, to measure the duration of horse-races, etc., by two little spots of ink which the instrument is made to deposit; it will measure tenths of a second.

Chronometer. See WATCH.

Chrysaniline. See ANILINE (YELLOW).

Chrysoberyl, a gem much prized when transparent and free from flaws. It is a hard, aluminous stone of a green color, sometimes with a yellow or brownish tinge, and occasionally presenting internally an opalescent, bluish-white light. It occurs crystallized, and in rolled fragments. Sp. gr. 3.7. The finest specimens are procured from Brazil.

Chrysolite, an ornamental stone of a bright yellow color, sometimes tinged with green or brown; transparent or translucent; and possessing double the power of refraction. It is found in angular, or somewhat rounded, crystalline masses, and in prismatic crystals. Sp. gr. 3.4. The best specimens are brought from Egypt.

Chrysoprase is a rare pale-green chalcedony, found in Upper Silesia and in Vermont, which owes its color to the presence of nickel. It loses the delicacy of its original hue by being much handled or worn as an ornament; it is, however, much prized by jewellers, and usually cut into a convex form.

Chuck, a piece of wood or metal affixed to the end of the mandril of a lathe for keeping fast the body to be turned.

Chudder, a wrapper for a female, in India, used to envelop the upper part of the person. It is worn in loose folds, and the material may be either silk, muslin, or cambric, etc.

Chu-lan, a name in China for the spikes of flowers of *Chloranthus inconspicuus*, which are there used to scent tea.

Chumbalee Oil, an Indian name for the essential oil of jasmine.

Chump, a short, thick, heavy piece of wood, less than a block in size. — A bony part of the loin in meat.

Chunam, an Indian name for lime made from sea-shells or coral.

Chundoo, a small dry measure of Ceylon, about the quarter of a pound; one fourth part of a seer.

Chupah, a Malayan grain measure, the fourth part of a guntorig; 30 chupahs make one bushel of rice = to 56 lbs.

Church Plate, the utensils for the administration of the Eucharist.

Church Regalia. See REGALIA.

Churka, corrupted from the Bengalee charaki, a wheel or rotatory machine; a rude hand-mill with rollers for cleaning cotton from the seeds in India.

Churn, an agitating instrument for separating the butter from milk, of which there are several kinds. See BUTTER.

Churn-Drill, a large drill several feet long, with a chisel joint at each end, used in the mining districts.

Churrus, a crude, resinous exudation, obtained from the Indian-hemp plant, *Cannabis indica*.

Chutney, or **Chutnee**, a condiment or pickle made in India, compounded of sweets and acids, of which there are several local kinds, as Cashmere chutney, Madras chutney, Bengal chutney, sweet chutney, green mango chutney, etc. It is much eaten in the East with curries, stews, etc.

Cibarious, good for food, esculent.

Cider [Fr. *cidre*; Ger. *Apfelwein*; It. *cidro*; Sp. *sidra*], an alcoholic beverage obtained by the fermentation of the juice of apples. When of good

quality, and in good condition, *C.* is a wholesome, agreeable, and refreshing stimulant beverage; but it is very prone to undergo acetous fermentation, and develops a rough, sharp, vinegary taste, and in that condition its consumption readily causes diarrhœa and colic. *C.* is largely prepared and consumed in the S.W. counties of England, and the N.W. departments of France; also in Upper Austria, Wurtemberg, the districts of the Maine and the Moselle, in Holland, and in most of the Northern States of America. The best *C.* made at the present day is that of Normandy (France), Newark (U. States), and Herefordshire (England). *C.* is sold by the barrel, or in bottles. The best *C.* contains from 8 to 10% of absolute alcohol; ordinary *C.* from 4 to 6%. *Imp.* duty 20 per cent.

C. apples are classed under three heads, — bitter, sweet, and sour. The first are the best; their juice has the greatest specific gravity, is the richest in sugar, ferments the most freely, clarifies spontaneously the quickest, and keeps the best after fermentation. They contain a minute quantity of extractive matter, which is not present in other apples. The juice of sweet apples ferments tumultuously, clears with difficulty, and the resulting *C.* does not keep so well as that produced from the first variety. The juice of sour apples contains less sugar and more acid than the other two, and consequently not only produces the weakest, but the worst *C.*; it, however, "fines" well, although it "stores" badly. Sour and "rough-tasted" apples are usually preferred by farmers for making *C.* This preference may be readily accounted for. The sour and rough-tasted apples contain less sugar and more malic acid than some of the other varieties, and the presence of this acid impedes the conversion of the alcohol of the *C.* into vinegar, a change which their rude mode of operating renders otherwise inevitable. But *C.* made with such apples never equals in quality that prepared at a low temperature, from fruit abounding in sugar, provided equal skill is exercised in the manufacture as in the process of converting malt-worts into beer. The process of making *C.* varies in different places, but in every case essentially consists of the collection of the fruit, the expression and fermentation of the juice, and the storing and management of the fermented liquor. The collection of the fruit should not be commenced before it has become sufficiently mature, and should be performed with greater care than is commonly bestowed upon it. The apples, after being gathered, are usually left for 14 or 15 days in a barn or loft to mellow, during which time a considerable portion of the mucilage is decomposed, and alcohol and carbonic acid developed. If this "ripening" is allowed to go too far, loss arises notwithstanding the vulgar prejudice in its favor. The spoiled apples are then separated from the sound ones, as they not only impart a bad flavor to the *C.*, but impede its spontaneous clarification. The expression of the juice is the next step. The apples are crushed or ground in mills consisting of two fluted cylinders of hard wood or cast-iron, working against each other. The common practice is next to sprinkle the pulp with $\frac{1}{8}$ to $\frac{1}{4}$ of its weight of spring or river water, and then to allow it to remain in tubs or wooden cisterns for 12 or 14 hours, during which time incipient fermentation commences, and the breaking up of the cells of the membrane takes place, by which the subsequent separation of the juice is facilitated. This plan, though general among *C.* manufacturers, is prejudicial to the quality of the future liquor, as not only is a portion of the newly formed alchohol lost, but the skins and pips often impart to it a disagreeable flavor. By employing more efficient crushing machinery this system of vatting is rendered quite unnecessary. A machine furnished with a revolving circular rasp, similar to that used in making potato starch, is admirably adapted to this purpose. The pulp of the crushed or ground apples is now placed on a kind of wicker frame, or in hair-cloth or coarse canvas bags, and, after being allowed to drain into suitable tubs or receivers, is subjected to powerful pressure, gradually applied, in the cider-press. The liquor which runs off first is the best, and is usually kept separately; whilst that which follows, especially the portion obtained by much pressure, tastes of the pips and skins. The expressed juice, or *must*, obtained as above, is next put into clean casks with large bung holes, and freely exposed to the air and the shade, where they are placed on *stillions*, with flat tubs under them to catch the waste. They are now constantly attended to and kept quite full, in order that the yeast, as it forms, may froth over and be carried off from the surface of the liquor. After 2 or 3 days for weak *C.*, and 8 or 10 days for strong *C.*, or as soon as the sediment has subsided, the liquor is *racked off* into clean casks, which have been (according to the common practice) previously sulphured with a cooper's match. The casks containing the racked *C.* are then stored in a cellar, shaded barn, or other cool place, where a low and regular temperature can be insured, and are left to mature or ripen. By the following spring the *C.* is commonly fit for use, and may be *re-racked* for sale. Preparatory to bottling *C.* it should be examined, to see whether it is clear and sparkling. If not so, it should be clarified in a similar way to beer, and left for a fortnight. The night before it is intended to put it into bottles the bung should be taken out of the cask, and left so until the next day, and the filled bottles should not be corked down until the day after, as if this is done at once many of the bottles will burst by keeping. The best corks should alone be used. Champagne bottles are the variety generally chosen for *C.* It is usual to wire down the corks, and to cover them with tinfoil, after the manner of champagne. A few bottles at a time may be kept in a warm place to ripen. When the *C.* is wanted for immediate use, or for consumption during the cooler portion of the year, a small piece of lump sugar may be put into each bottle before corking it; or, what is the same thing in effect, the bottles may be corked within 2 or 3 hours after being filled. In summer, and for long keeping, this practice is, however, inadmissible. The bottled stock should be stored in a cool cellar, when the quality will be greatly improved by age. *C.* for bottling should be of good quality, sound and piquant, and at least a twelvemonth old. When out of condition it is unfit for bottling. Much of the excellence of *C.* depends upon the temperature at which the fermentation is conducted, a point utterly overlooked by the manufacturers of this liquor. Instead of the apple juice, as soon as it is expressed from the fruit, being placed in a cool situation, where the temperature should not exceed 50° or 52° F., it is frequently left exposed to the full heat of autumn. In this way much of the alcohol formed by the decomposition of the sugar is converted into vinegar by the absorption of atmospheric oxygen, and thus the liquor acquires that peculiar and unwholesome acidity known in the *C.* districts by the name of "roughness." When, on the contrary, the fermentation is conducted at a low temperature, nearly the whole of the sugar is converted into alcohol, and this remains in the liquor, instead of undergoing the process of acetification. The acetous fermentation, by which alcohol is converted into vinegar, proceeds most rapidly at a temperature of about 90° F., and at lower temperatures the action becomes gradually slower, until at 46° to 50° F. no such change takes place. It is therefore evident that if the saccharine juice of apples, or any other fruit, is made to undergo the vinous fermentation in a cool situation, less of the spirit resulting from the transformation of the sugar will be converted into acetic acid, and consequently more will be retained in an unaltered state in the liquor to improve its quality, and by its conservative and chemical action to preserve it from future change.

Champagne Cider. — This name is given to a fine, pale variety of *C.*, much used for bottling, which has a great resemblance to inferior champagne. The best variety comes from New Jersey. The following is a good form for a "made" *C.* of this class: — Good pale vinous *C.*, 1 hhd., proof spirit (pale), 3 gals.; honey or sugar, 14 lbs.; mix well, and let them remain together in a temperate situation for 1 month; then add orange flower water, 3 pints; and in a few days fine it down with skimmed milk, $\frac{1}{2}$ gal. A similar article, bottled in champagne bottles, silvered and labelled, is often sold to the ignorant for champagne.

Cider-Apples, common kinds of orchard apples grown for making cider, which are usually distributed into 3 classes, the sweet, the bitter, and the sour.

Cider-Brandy, a liquor distilled from cider.

Ciderist, a maker of cider.

Ciderkin, a weak kind of cider.

Cider-Vinegar, vinegar made from refuse cider.

Cie, the French abbreviation for Company, synonymous with our Co.

Cigar and **Cigarette**. See TOBACCO.

Cigar-Box, a wooden box, usually of cedar, in which cigars are packed.

Cigar-Case, a pouch or fancy receptacle to hold cigars for the pocket.

Cigarette-Making Machine, a newly invented machine by which 80 to 100 cigarettes per minute are made, and much neater than those made by hand.

Cigarette-Paper, a thin paper for rolling cut tobacco in for smoking, which is made largely in Spain and France.

Cigar-Holder, **Cigar-Tube**, a mouth-piece or tube for holding cigars; also, a cigar-case.

Cigar-Machine and **Cigar-Mold** are machines for making fillers of cigars and wrapping them.

Cimolite, or **Kimaulia-Earth**, a hydrous silicate of alumina of a grayish-white color, occurring

in the Grecian island of Cimoles. It has the property of cleaning cloth, and bleaching linen, and is used as a substitute for fullers' earth.

Cinchona, Peruvian Bark [Dutch *china-bast;* Fr. *quinquina;* Ger. *Kron-china;* Sp. *quina, quenquina*]. There are nearly 40 different known species of *C.* trees, from the bark of many of which is obtained the celebrated medicine *quinine.* The original habitat of the genus *C.* is the Andes, where it is found at a height of between 3,000 and 12,000 feet above the sea, growing mostly in patches, distributed amongst the palms, plantains, and other tropical trees that form the vast forests, for the most part clothing the eastern slopes of the Cordilleras, and extending from 10° north to about 19° south latitude. In this district there is always an abundance of moisture and a mean temperature of about 62°. In 1853 the Dutch government introduced the *C.* into Java, and in 1861 the East Indian government, following their example, introduced it into British India, where it is now acclimatized, large plantations of it growing on the Neilgherries and in the valleys of the Himalayas. The *C.*

Fig. 77. — Cinchona Calisaya.

is now also successfully cultivated in Ceylon and Jamaica. The department of agriculture of the U. States has tried for many years to introduce the cultivation of several species of *C.* in Southern California, and in several of the Southern States, more particularly Florida, but all the experiments made were unsuccessful, owing to adverse climatic conditions, showing that the plant will not stand the slightest degree of frost without injury. The febrifuge powers of *C.* are said to have been made known in Europe in 1640, by a Countess of Chinchon, wife of the viceroy in Lima, who had been cured by it. The bark is collected in the forests in the dry season, and sent in bundles in the green state to the nearest inhabited place, where it is dried in the sun, the utmost care being requisite to protect it from wet, as even a few hours' dew falling on the half-dried bark will give to the interior a blackish appearance, and greatly lessen its value. The finest is said to come from single trees growing in the most elevated spots, but there are many varieties; and as moisture and adulteration are also common, great experience is necessary to select the finest kinds. It is asserted that 800 to 900 trees are cut down in order to furnish 11,000 lbs. of bark, and that 25 to 50 ounces, $1\frac{1}{2}$ to 3 per cent, are the two extremes of quinine obtained from 100 lbs. bark. *C.* bark is brought to the U. States in chests or serous. The quantity imported varies greatly from one year to another, and prices are in consequence also greatly variable. 4,853,006 lbs., valued at $1,417,695, were imported in 1878, from the U. States of Colombia, Brazil, Venezuela, and England. *Imp.* duty, bark and root, free; muriate of *C.*, 40 per cent.

The following varieties are distinguished by English and American druggists: —

1. Pale or Crown Bark (Sp. *Cascarilla fina de Uritusinga*), the produce of the *C. Condaminea, C. crispa,* and other varieties of the *C. officinalis* of Linnæus, is the original *C.* of Peru. It is quilled, straight, 6 to 15 inches long, from the size of a crow-quill to that of the thumb in diameter, and in thickness from $\frac{1}{30}$th to $\frac{1}{6}$th of an inch. Epidermis entire, with external surface longitudinally furrowed, and crossed with fissures; it presents various tints of gray, irregularly covered with minute white lichens. Inner surface and powder of a cinnamon-brown color. Taste, bitter, somewhat acid, aromatic, and astringent; odor, faint, peculiar, and aromatic. The quills of middle size are preferred.

2. Gray Bark (Sp. *Cascarilla provinziana*), also called silver bark, and Huanaco bark, procured from the *C. scrobiculata* of Humboldt, is exported from Lima. It occurs in quills larger than the preceding, less furrowed, more uniformly grayish-white, inside redder, fracture closer and more resinous; epidermis entire. Taste and odor nearly identical with crown bark. It is a superior kind, but it comes mixed with ash-bark and rusty bark.

3. Calisaya or Yellow Bark (Sp. *Cascarilla Calisaya*), the source of Quinine, grows in Bolivia and the Peruvian province of S. Caravaya. It occurs partly quilled and partly flat. The quills, larger than the crown and gray, are 9 to 15 inches long, 1 to 2 inches in diameter, and $\frac{1}{8}$ to $\frac{1}{3}$ inch thick; generally single, with the epidermis wrinkled longitudinally, and with transverse fissures; rough; grayish-brown, mottled with lichens. Inner surface smooth, and yellower than the preceding kinds. Transverse fracture close but splintery. Taste and odor stronger than pale bark. The flat pieces, often stripped of their epidermis, are 8 to 18 inches long, and 1 to 4 inches broad. Good flat bark is preferred to the quilled; and the finest are the middle-sized pieces, dense and close in texture. Cuzco bark and Orange bark are sometimes substituted for this kind.

4. Red Bark (Sp *Cascarilla colorada*), growing on the Andes, chiefly in Ecuador, in the forests of Chimborazo It consists sometimes of quilled, but more commonly of flattish pieces, from 2 inches to 2 feet long, 1 to 5 inches broad, and $\frac{1}{4}$ to $\frac{3}{4}$ inch thick; generally covered with the epidermis, which is rough, wrinkled, little fissured, reddish-brown, with grayish efflorescence in the hollows, from lichens. Taste very bitter and astringent. The quills, similar in size to those of yellow bark, are paler than the flat pieces. Red bark is scarce, dear, and rarely seen genuine

The inferior, yet still genuine kinds, are chiefly, — Ash-bark, of unknown origin, mostly used for adulterating pale: Rusty bark, imported from Lima, little esteemed; White Loxa bark differs little from Rusty. Hard Carthagena bark, and Woody Carthagena bark, both quilled and flat, are little valued, Cuzco bark, a good species, very bitter, is rare in the English trade; and Orange bark of Bogota, which resembles yellow bark, but is spongy, and feebly bitter The spurious barks used in adulterations are chiefly species of Exostemma, Buena, and Strychnos

Cincinnati, one of the most important commercial and manufacturing cities of the U. States, situated in the S.W. part of the State of Ohio, on the N. bank of the Ohio River, in lat. 39° 6′ N., lon. 84′ W., 120 m. S.W. of Columbus (cap. of the State), 340 m. E. of St. Louis, 280 m. S.E. of Chicago, and 610 m. W. by N. of Washington. It is the cap. of Hamilton Co., and in size is the first city in the State of Ohio, and the eighth in the U. States. On the opposite side of the Ohio River, in the State of Kentucky, are Covington (pop. 24,505), and Newport (pop. 15,087). Communication between these cities and *C.* is afforded by two bridges and three steam-ferries. The wire suspension bridge, which is 1,057 feet long between the towers (or, including the approaches, 2,252 feet), with a height of 100 feet above low water, was completed in 1867 at a cost of nearly $2,000,000. *C.* covers an area of 24 sq. m., extending along the river about 10 m., with an average width of 3 m. It is a fine and wealthy city, also noted for the beauty of its suburbs and its surrounding scenery.

Founded in 1788, *C.* was incorporated as a city in 1814, and soon acquired a commercial importance which has steadily increased. Seven railroads entering the city are used by thirteen companies, and besides these two lines terminate at Covington on the opposite side of the river. About 300 passenger and freight trains arrive and leave daily on these roads. For their use are four depots near the river in different parts of the city. Communication with different parts of the city and with the suburbs is afforded by 14 lines of street railroad, with about 50 m. of track, and by numerous lines of omnibuses and stages. The top of the adjacent hills is reached by an inclined steam passenger-railway. The position of the city on the Ohio River gives it communication with the extensive river system of the Mississippi valley; while it is connected with Lake Erie by the Miami Canal, whose northern terminus is at Toledo, Ohio. The Miami is connected by a branch with the Wabash and Erie Canal, the largest in the U. States (374 m.), which extends from Toledo to Evansville, Indiana, on the Ohio River. The whole number

Fig. 78. — Tyler Davidson Fountain.
(*Cincinnati.*)

of steamboats, towboats, and barges plying between *C.* and other ports, for the year ending Aug. 1878, was 342, with an aggregate tonnage of 84,868. The number of arrivals of steamboats in 1878 was 2,912, in comparison with 2,648 in 1877, and the departures were 2,942, compared with 2,653 in the preceding year. The large steamboats of the Mississippi River are enabled to reach *C.* by means of the canal around the falls of the Ohio at Louisville, Kentucky, which was opened in 1872. About three fourths of the commerce of the city is by railroad and canal, and the remainder by river transportation. The extent of the entire commerce is indicated by the value of imports, which for the year 1878 was $223,237,157, and of exports for the same year $186,209,646. *C.* is one of those interior ports to which, under the act of Congress passed in 1870, foreign merchandise may be transported without appraisement and payment of duties at the port of first arrival. The value of such imports to this city during the year 1878 was $632,528, on which the duty paid was $271,590. The total value of the products of manufacturing industry has increased from $46,995,062 in 1860 to $127,459,021 in 1870 and $133,125,768 in 1877. The details for the last-mentioned years are as follows: —

Industries.	1870.		1877.	
	Hands empl'd	Value of products	Hands empl'd	Value of products.
		$		$
Iron	10,723	20,804,263	7,588	13,288,749
Other Metals	1,809	3,873,356	2,664	4,491,030
Wood	7,597	12,699,165	8,086	13,867,604
Leather	4,647	7,227,324	5,553	7,352,039
Food	2,334	17,945,651	4,366	23,710,093
Soap, Candles, and Oils	1.122	7,455,561	1 071	8.293,930
Clothing	12,363	12.626,682	16,904	12 259,010
Liquors	2,301	16,361,006	1,841	23,617,711
Cotton, Wool, Hemp, etc.	1,035	1,854,774	1,272	1,572,532
Drugs, Chemicals, etc	735	3,544,195	624	4,125,648
Stone and Earth	2,209	2,980,102	2,225	3,194,815
Carriages, Cars, etc.	1,175	1,794,413	1,858	2,354,064
Paper, etc.	452	880,516	999	2,140,402
Book Binding and Blank Books	424	626,870	519	642,700
Printing and Publishing	2,588	4,699,280	2.510	4,957,426
Tobacco	3,886	5,837,690	3,400	4,215,724
Fine Arts	250	540,746	340	520,180
Miscellaneous	4,177	5,697,427	2,421	4,520,111
Total	59,827	127,459,021	64,709	135,123,768

The leading commercial organization in *C.* is the Chamber of Commerce and Merchants' Exchange, which has about 1,200 members, holds daily sessions, and publishes yearly reports of the highest interest. The Board of Trade has about 900 members, chiefly manufacturers. There are also a mechanics' institution, cotton exchange, a pork-packers' association, 4 commercial colleges, etc. *C.* contains 6 national banks with a capital of $4,300,000, and 17 private banks with a capital of $2,168,000. It has a paid fire department under the control of 5 commissioners appointed by the Mayor. The city is supplied with water obtained by pumping from the Ohio River by means of three immense reservoirs, two of which have a capacity of 100,000,000 gallons each. An industrial exhibition has been held in *C.* in the autumn of each year since 1871, and has attracted numbers of visitors to the city. The buildings are centrally situated, and occupy 3¼ acres of ground. Pop. about 300,000.

The following cursory review of the most important branches of commerce and industry of *C.* is condensed from the Report of the Chamber of Commerce for the commercial year ending August 31, 1878: —

Beer. — The celebrated lager beer of *C.* goes to all parts of the U States, and, in addition to that which is bottled in the city, is largely bottled in New York for shipment to Madras, Bombay, and Calcutta, whither it has been exported with satisfactory results. The total quantity of malt liquors manuf. in *C* in the year was the largest in the history of the city, having been 550,518 barrels, against 475,212 in 1877, and 467,790 in 1872. In gallons, the product in *C.* aggregated 17,066,058, against 14,731,571 in the preceding year. In the production of the beer, there were consumed of malt 1,316,741 bushels; hops, 1,122,062 lbs.; rice, 697,030 lbs. In addition to these there were consumed approximatively, of coal, 6,000,000 bushels; coke, 3,750,000 bushels, and ice, 60,000 tons. The business with other localities exhibits a steady increase, as shown by the following table: —

Years.	Receipts, bbls.	Shipments, bbls.
1869	3,408	65,920
1870	6,569	86,540
1871	5,155	117,909
1872	4,610	130,825
1873	5,897	123,625

Years.	Receipts, bbls.	Shipments, bbls.
1874	4,882	121,604
1875	6,422	109,172
1876	7,913	125,360
1877	5,431	148,519
1878	7,882	184,634

Boat Building. — This line of business shows a decided increase over the previous year, the whole number of vessels built having been 22, of which 18 were steamers (including ferry-boats), with an aggregate tonnage of 6,704, against 14 vessels and a tonnage of 4,434 in 1877.

Boots and Shoes. — The aggregate business in sales, both of manufacturers and jobbers, decreased about 10% in 1878, in consequence of the general depression of trade; but the following table of imports and exports, during a period of 10 years, shows a steady progress in the manufacturing business, the demand increasing as the qualities of the *C* work became better known: —

Years.	Receipts. Cases.	Shipments. Cases.
1869, cases	51,162	21,829
1870, do	90,994	17,698
1871, do	104,907	48,134
1872, do	108,627	38,894
1873, do	79,928	42,807
1874, do	91,584	47,733
1875, do	88,049	57,548
1876, do	78,820	79,100
1877, do	117,000	100,820
1878, do	85,931	97,972

Candles and Soap. — The future of the candle business is by no means clear, the general introduction of other kinds of artificial light having made inroads on the relative demand for these goods. The fine *C.* candles, however, are beginning to come into successful competition in foreign countries with candles made abroad. The shipments for the year 1878 were 231,727 boxes, against 238,654 in the preceding year. While the production of candles scarcely holds its ground, the manuf. of soap exhibits a marked increase. The quantity produced in 1878 was the largest in the history of the city, the total shipments at *C.* aggregating 366,802 boxes, against 332,533 in the previous year. The production of soap from cotton-seed oil, which originated in this city, is yearly assuming more importance. The *C.* soaps go to all parts of the country. Maine, California, and Texas are all liberal customers of *C.* manufacturers, while in a prime grade of laundry soaps *C.* finds a market in the Eastern cities.

Cotton. — Table showing the annual receipts and shipments at *C.* for a period of 10 years: —

Years.	Receipts, bales.	Shipments, bales.
1869	137,417	137,043
1870	153,639	148,034
1871	230,411	182,856
1872	122,128	117,349
1873	137,575	127,489
1874	195,895	188,083
1875	151,980	150,550
1876	185,376	171,773
1877	175,527	171,834
1878	184,895	183,983

Furniture. — *C.* is making steady progress in extending the foundation of this great branch of its trade. A happy change in the style of the best class of furniture has been accomplished. The old Gothic designs and the newer Eastlake patterns have nearly all been swept away by the lower, more graceful, and lighter furniture of Queen Anne's period. The relation which this thorough change in the architecture of domestic articles sustains to the International Exhibition at Philadelphia is a very close one, and indicates the importance of such an institution as a public educator. The shipments by public conveyance in 1878 were 124,127 pkgs. furniture, and 17,761 dozen chairs.

Grain. — In the year 1878 the aggregate receipts of all kinds of grain reached 11,165,697 bushels, against 8,778,581 in the previous year; while the exports were 4,698,608 bushels, against 2,716,857 in 1877. Though this considerable increase is mostly traceable to the abundant crops of 1878, it yet sustains the most intimate and important relation to the enlargement of general facilities for trade. *C.* is the natural wheat granary for the great winter producing region of the interior, and, with her railroad system completed, it will be one of the greatest grain warehouses for the South. The following table shows the annual receipts and shipments of corn and wheat, for a period of 10 years: —

Years.	Corn.		Wheat.	
	Receipts, bush.	Shipments, bush.	Receipts, bush.	Shipments, bush.
1869	1,508,509	188,784	1,075,348	702,622
1870	1,979,645	384,500	1,195,341	806,775
1871	2,068,900	672,628	866,459	409,893
1872	1,828,866	246,632	762,144	323,405
1873	2,259,544	324,183	860,454	412,722
1874	3,457,164	658,718	1,221,176	783,990
1875	3,695,561	595,915	1,135,388	600,622
1876	4,115,594	1,028,325	1,052,952	558,252
1877	4,559,506	1,317,142	1,436,851	961,754
1878	4,321,456	1,236,439	3,405,113	2,867,082

Paper. — The production for 2 years of the mills tributary to the city, according to returns made to the Superintendent of the Merchants' Exchange, will be found in the following table, which embraces the mills of 29 firms or companies: —

Kinds.	1878.		1877	
	Pounds.	Value.	Pounds	Value.
Book	11,885,330	$1,147,909	7,177,588	$871,833
Manilla	9,663,257	692,257	9,443,722	769,023
News	8,903,453	621,422	9,919,282	716,196
Roofing	5,894,030	169,224	5,100,578	155,511
Wrapping	9,568,145	224,893	9,823,066	287,438
Writing	1,433,200	229,635	1,512,832	289,020
Total	47,347,415	$3,085,340	42,977,068	$3,089,021

The whole number of paper bags and paper flour-sacks manufactured in 1878 was 117,901,955, with a value of $388,263, against 109,923,749, and a value of $371,914, in 1877. This department of the paper manufacture has had enormous growth in a few years, and has acquired the larger distinction at the French Exposition of 1878 by the honorable mention received by the *C* firm that has done so much to develop this business into one of the important branches of *C.* industry.

Pork Packing and Live-Stock Business — Prior to 1863 *C.* was the chief centre in the U. States for the slaughtering of swine and the packing of pork Since that year the supremacy has been held by Chicago, *C.* taking the second rank. There are about 60 establishments in *C.* employed in this industry. The United Railroads Stock Yards for the reception of live hogs occupy about 60 acres. The whole number of hogs packed at *C.* in the winter season of 1877-78 was the largest number ever packed in this city, but the prices for cured meats were so much depreciated during that year, that the packing business was utterly unprofitable to the manufacturers The following table shows the total number of hogs cut at *C.* for 10 consecutive years: —

Years.	Nos.	Years.	Nos.
1869	365,555	1874	581,253
1870	337,330	1875	560,164
1871	481,568	1876	563,359
1872	530.301	1877	523,576
1873	626,305	1878	632,302

Though the year 1878 was an unfortunate one, as far as the packing business is concerned, there was further evidence of the growth and concentration of the live-stock business at *C.*, as shown by the following table of receipts and shipments of hogs, cattle, and sheep, at the United Railroads Stock Yards, for 5 years: —

Years.	Hogs.		Cattle.		Sheep.	
	Receipts	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
1878	793,863	175,103	142,851	52,902	274,027	207,103
1877	633,749	143,650	149,781	63,439	172,084	123,235
1876	680.362	144.205	144,600	52,308	180,389	127,982
1875	725,162	130,012	133,695	44.837	159 302	91,121
1874	873,263	259,397	112,393	30,546	139,280	83,894

Starch. — Among the many industries of *C.* there is no one exhibiting a more steady progress, prosecuted with a larger vigor, or doing more to spread the good name of *C.*'s productions through the world, than starch. The starch of *C.* is not

only widely distributed to all parts of this country, but is largely exported, nearly all the countries of Europe now taking it liberally, besides Mexico, South America, and Australia. Especially has it made a sure lodgment in Germany, its cheapness and its superior quality having immensely reduced both the demand for and production of potato starch in that country. The shipments of starch in 1878, as shown by the transportation books of the city, were 399,931 boxes, but to this should be added the shipments made directly from the manufactories, without coming to the city, which would swell the shipments, approximatively, to 485,000 boxes.

Tobacco. — The extraordinary strides which *C.* has made toward the concentration of the tobacco interest may be seen, to some extent, in noticing what has been accomplished in two decades. In 1858 the receipts of tobacco in hogsheads were only 4,476 packages, contrasted with 88,280 hogsheads in 1878. The leaf tobacco business, in 1878, was the largest the city had ever enjoyed, the sales having been 40,140 hogsheads, against 34,743 in 1877. During this year the *cutting leaf* tobacco, which is raised on both sides of the Ohio River, attained a notoriety for plug purposes which placed it in advance of all competitors, and nearly doubled the value of the leaf tobacco of the *C.* district. The whole number of cigars made in *C.*, Covington, and Newport in 1878 was 103,020,275, against 88,792,375 in 1877. The number of cigarettes manufactured in the three cities was 1,915,000, against 705,000 in the previous year. The total production of fine-cut (chewing) and plug tobacco in *C.* and Covington — which commercially and industrially are substantially *C.* — was 4,307,129 lbs., against 4,734,339 in 1877, the reduction being in fine-cut tobacco. The production of smoking tobacco was 2,147,027 lbs., against 1,698,298 lbs. in the preceding year. The following table shows the movement of tobacco at *C.* for 10 years: —

Years.	Receipts.			Shipments.		
	Leaf.		Manufactured. Pkgs.	Leaf.		Manufactured. Pkgs.
	Hhds.	Boxes and bales.		Hhds.	Boxes and bales.	
1869..	39,978	4,753	23,545	36,810	6,143	36,862
1870..	46,563	9,961	53,961	42,538	6,199	88,149
1871..	56,283	9,083	61,497	50,541	2,493	110,652
1872.	45,877	11,176	59,535	39,566	1,738	146,771
1873..	61,876	5,278	89,650	59,169	4,897	174,749
1874..	73,093	4,253	123,714	66,094	4,365	255,210
1875..	45,234	5,359	114,925	43,249	8,776	217,392
1876..	61,338	13,230	150,336	59,103	12,245	297,960
1877..	71,217	8,830	190,445	68,759	17,906	365,148
1878..	88,280	14,992	195,572	85,049	15,174	422,661

Whisky. — The rapid growth and general introduction of continuous distillation has largely changed the aspect of the whisky business, especially in the West, so that the work of redistillation from high wines, according to the old methods, relatively, has seriously lost ground in production, and it is difficult to forecast its destiny. The definition of a rectifier is so broad, reaching rectifying, purifying, distilling, mixing, compounding, etc., and the continuous spirits, which now find their way into so many channels, by which they ultimately reach the books of the Collector as rectified spirits, that, to arrive at the extent of the production of redistilled goods, technically considered, the whole being returned under one head, is no longer possible. It is no secret that, in quantity, such goods sustain a much less important position, in their relation to the general production, than existed prior to the introduction of continuous distillation, and the signs of the time indicate a production relatively still less. So rapidly have distillers availed themselves of the continuous process, it is estimated that but one distillery in the *C.* district is now making high wines exclusively. The whole number of gallons of goods of all kinds returned to the Collector as rectified spirits, in *C.* and in Covington (none was rectified in Newport), for 1878, was 12,072,483.45 gall., compared with 11,443,880.70 gall. in 1877, and 11,659.644.99 gall. in 1876, showing an increase of 628,603.75 gall. in comparison with 1877, and an increase of 412,838.76 compared with 1876. Now these figures embrace only so much of the continuous spirits as are subjected to some such change as brings them within the range of rectified goods, so that the aggregate does not, by any means, show the whole quantity which passes beyond the stage of high wines in the city. If to the above figures were added such of the continuous spirits as are not returned to the Collector as rectified goods, it would still more largely swell this aggregate. Continuous spirits are now a leading article of commerce, and leave the city in large quantities for other markets. It is no easy matter, at present, to arrive at the real extent of the whisky business in this city. Of course, we have the figures of the revenue, which are most satisfactory data, so far as actual production in *C.*, Covington, Newport, and Petersburg is concerned, making an aggregate in distilled spirits of 10,392,515.09 gall. for the year 1878. But in addition to this production, large quantities of spirits arrive from other districts and enter into the manufactures and commerce of the city. The receipts by public conveyances in 1878 aggregated 155,970 barrels. Embraced in these arrivals, however, are spirits some of which have already been comprised in the returns already given in the two districts. Making due allowance for this duplication, it would make the aggregate received from points beyond the four cities named, amounting to 5,665,702 gall. If to these spirits be added the actual production in the four cities, it would make a total business in spirits, in original or tax paid packages, of 16,058,217 gall., with an approximate aggregate value of $18,000,000. But the business in whisky is still further largely swelled by the rectifying process, to which much of the spirits after leaving the distilleries is subjected, and though the spirits already reported enter into this, it is separate business and adds material value to the goods. It will thus be seen to what proportions this business in whisky rises, towering among the other industries and trades like a giant, and steadily increasing the scope of its influence. The following table shows the receipts and shipments of whisky at *C.* for 10 years: —

Years.	Receipts, bbls.	Shipments. bbls.
1869	263,524	290,510
1870	444,291	441,820
1871	313,072	375,699
1872	316,041	395,764
1873	273,848	369,902
1874	338,631	335,684
1875	306,324	347,433
1876	295,012	329,021
1877	320,877	370,684
1878	*119,639	351,473

* Not including whisky manufactured in Hamilton Co. and Covington, etc., which was previously embraced.

Cincinnati R.R. Cos. See APPENDIX.

Cinders, the small refuse pieces left after the combustion of coal. See SLAG.

Cinder-Sifter, a perforated shovel or sieve for separating the fine coal dust or ashes from large cinders.

Cinnabar [Chinese *chú shá*; Fr. *cinnabre*; Ger. *Zinnober*; It. *cinabro*; Sp. *cinabrio*; Lat. *cinnabrium*], a mineral substance, red, heavy, and brilliant. It is found in various places, chiefly in quicksilver mines, being one of the ores of that metal. The *C.* of the Philippine Islands is said to be of the highest color; but that of Almaden, in Spain, is the richest. It is also abundant in the central and western provinces of China, and in California. The best native *C.* is of a high color, brilliant, and free from earthy or stony matter. It is a product of considerable importance in the arts. Generally, however, the factitious kind is employed. See VERMILION.

Cinnamon [Chinese *ján kwei*; Fr. *cannelle*; Ger. *Zimmet, Kanehl*; It. *canella*; Sp. *canela*; Lat. *cinnamomum, canella*], the inner bark of the *C.* tree (*Laurus cinnamomum*), a native of Ceylon, where it grows in great abundance, Cochin China, and perhaps of some other countries. It is brought in bags or bales weighing 92½ lbs. each; and, in stowing it, black pepper is mixed with the bales to preserve the cinnamon. The best *C.* is thin and rather pliable: it ought to be about the substance of royal paper, or somewhat thicker; is of a light yellowish-brown color, approaching nearly to that of Venetian gold; it is smooth and shining; fractures splintery; has an agreeable, warm, aromatic flavor, and a mild, sweetish taste; when chewed, the pieces become soft, and seem to melt in the mouth; it is not so pungent but that it may be borne on the tongue without pain, and is not succeeded by any after taste. Whatever is hard, thick as a half-crown piece, dark-colored or brown, or so hot that it cannot be borne, should be rejected. Particular care should be taken that it be not false packed, or mixed with *C.* of an inferior sort. The *C.* of Cochin China grows in the dry,

sandy districts, lying N.W. of the town of Faifoe, between 15° and 16° N. lat. It is preferred in China to the *C.* of Ceylon: the annual imports into Canton and other ports vary from 250,000 to 300,000 lbs. There are no fewer than 10 varieties of this species in the market. It is not cured, like that of Ceylon, by freeing it from the epidermis.

Fig. 79. — Cinnamon-Tree.

Besides the produce of the inner bark of the *Laurus cinnamomum*, the bark of the root affords a volatile oil which is similar in flavor to oil of *C.*, but has also a camphorous pungency. Another kind of oil is distilled from the leaves. The *C.*-leaf oil of commerce is of two kinds; one fatty, and probably procured from the fruit; the other volatile, and similar in taste and odor to oil of cloves or oil of pimento. The principal *C.* gardens of Ceylon are near Colombo. The seeds are planted so that the shrub should grow in clumps or clusters. The shoots which are decorticated are generally from 1 to 3 inches in diameter. The finer and thinner the bark, the more valuable is the product. The *C.* harvest lasts from May to October. *C.* is obtained from China, the Malabar coast, Manilla, Java, Cayenne, the Leeward Islands, and the Isle of France. The produce of China is called Cassia (q. v.). *C.* is used in medicine as a carminative and astringent, chiefly as an adjuvant to other medicines. *Imp.* duty, *C.* and chips of *C.*, 20 cts. per lb.; oil of *C.*, free.

Cinnamon-Oil. See Cinnamon.

Cinnamon-Stone, a precious stone of a red color, with occasionally a brown or orange-yellow tinge; translucent, rarely transparent, lustre resinous. Sp. gr. 3.5. It is commonly found in masses, which are full of fissures, and rarely in a state fit for cutting. It is chiefly found in Ceylon and Brazil.

Cinquefoil, a common hedge-weed, the *Potentilla reptans*, which, having astringent, tonic, and febrifugal properties, is used medicinally.

Cinque Ports are five privileged and chartered ports of England on the coasts of Kent and Sussex, comprising the towns of Sandwich, Dover, Hythe, Romney, and Hastings. The Lord Warden of these ports still has special jurisdiction and important marine powers.

Cipolino, a variety of Italian green marble with white veins. — Also a mixture of talcose schist with white saccharoidal marble.

Circuit, the space traversed by a machine, etc. in moving round. — A district visited by a judge.

Circular, a printed or lithographed handbill, note, or advertising letter, issued by traders to customers, etc.

Circular Bolt, a machine used by the Nottingham lace manufacturers in making net.

Circular Note, a letter of credit granted by a banker for the convenience of travellers, and payable at different foreign towns.

Circular-Saw, a very useful machine tool, a revolving disk of steel with serrated edges or teeth, for cutting wood and metal. See Saw.

Circulating Library, a library from which books are sent out on loan to subscribers.

Circulating Medium is a term applied to all instruments of interchange by which the productions and the revenues of the country are distributed; everything which serves and is received as a mode of payment, or which constitutes the nominal money-price which appears in price-currents. — *Circulation* is the amount of such currency in use. When the term is applied to a bank, it means the amount of its paper issues.

Circulus, an instrument for cutting off the neck of glass.

Circumference, the boundary line of a circular plot; girth of a tree, etc.

Circumferentor, a surveyor's instrument for measuring angles.

Circumnavigation, the act of voyaging round the globe.

Circumpolar, lying around the pole.

Circumventor, a surveying instrument, having a compass-box at the top for taking angles.

Circus, a building or enclosure in which feats of horsemanship are exhibited.

Cire, the French name for beeswax.

Cismatan, the extremely bitter aromatic and somewhat mucilaginous seeds of *Cassia absus*, brought to Cairo from the interior of Africa, being regarded as the best of remedies for Egyptian ophthalmia.

Cist, anything for holding, as a bag, basket, case, or chest.

Cistern. See Tank.

Citizens', a Fire Insurance Co. of New York city, organized in 1857. *Statement* on Jan. 1st, 1879: — Capital stock, $300,000; net surplus, $503,768. Total cap. and surplus, $803,768. Risks in force, $42,657,046; premiums, $239,066. Premiums received since the organization of the Co., $5,567,781; losses paid, $2,419,285; cash dividends paid to stockholders, $1,367,550. Cash dividend paid in 1878, $70,536.

Citole, an instrument like the dulcimer.

Citrate, a salt in which the hydrogen of citric acid is replaced by a metal or other basic radical.

Citric Acid is obtained by a chemical process from lemon or lime juice. It forms beautiful crystals, of which the primary figure is a right rhombic prism. They have a sour taste, and are soluble in somewhat less than their own weight of cold, and half their weight of boiling water. They also dissolve in alcohol. The average proportion of *C. A.* afforded by a gallon of good lemon-juice is about 8 oz. This acid is prepared upon an extensive scale. It is an agreeable acid, at once cooling and antiseptic. It is much used in medicine as a substitute for lemon-juice, and to form effervescing draughts, citrates, etc. It is much used by calico-printers, being the best known resistant for iron and alumina mordants. *Imp.* duty, 10 cts. per lb.

C. A. is frequently met with adulterated with tartaric acid; the fraud is easily detected by dissolving the acid in a little cold water, and adding to the solution a small quantity of acetate of potash. If tartaric acid be present, a white, crystalline precipitate of cream of tartar will be produced on agitation. When pure it is devoid of color, is entirely, or almost entirely, decomposed by heat. It is soluble in water and in spirit, and what is thrown down from its watery solution by acetate of lead is dissolved by nitric acid. No salt of potassium precipitates anything with *C. A.* except the tartrate. When a few drops of a solution of *C. A.* are added to lime-water, a clear liquid results, which, when heated, deposits a white powder, soluble in acids without effervescence. By the action of nitric acid *C. A.* is converted into oxalic acid. When the crystals of *C. A.* are very deliquescent, the presence of free sulphuric acid may be suspected. This latter may be detected with facility by dissolving the citric acid in a little water, strongly acidifying the solution with hydrochloric acid, and adding chloride of barium, when, if sulphuric acid be present, an insoluble precipitate of sulphate of barium will fall down after a short time.

Citron [Fr. *cédrat;* Ger. *Succade;* It. *confetti dicedro;* Sp. *acitron verde*], an agreeable fruit, resembling a lemon in color, smell, and taste. It is the *Citrus medica* of botanists (Fig. 80), and is probably a mere variety of lemon. It is much larger than the lemon, of an ovoid shape, and with a very thick rind. The juice too is less acid than that of the lemon and lime. The cuticle of the rind is full of vesicles containing an essential oil,

Fig. 80. — CITRON-TREE.

called *Oil of C.* or *Oil of Cedrat*, on which the flavor of the rind depends, and which is much used in perfumery. The candied rind of *C.* is imported from Madeira, of the finest quality. The *Citrus medica* is a native of Asia; it is now cultivated in warm climates throughout the world. *Imp.* duty, 10 per cent; preserved in sugar, 35 per cent; oil of, free.

Citronella, an essential oil obtained from the grass *Andropogon citratum*, and chiefly imported from Ceylon. *Imp.* free.

Civaia, the Italian name for pulse, beans, pease, etc.

Civanzo, the name in Italy for interest.

Civet [Dutch, *civet;* Fr. *civette;* Ger. *Zibeth;* It. *zibetto;* Sp. *algalia*], a valuable perfume obtained from the civet cat (*Viverra civetta*), a native of Brazil, Guinea, Madagascar, and the East Indies; but of which numbers are kept for commercial purposes in Holland. This perfume is produced by both sexes, and is contained in two cavities or pockets placed beneath the tail; these cavities are smooth internally, and covered with numerous small pores, connected with the glands from which it is secreted. It is of a clear yellowish or brownish color, about the consistence of honey, and uniform throughout. Undiluted, the smell is offensively strong; but when mixed with other substances, it becomes what some consider a fragrant perfume. *C.* was formerly in high repute, but is at present little used, excepting in the composition of some kinds of perfumery, to increase the power of other scents. When genuine, it is worth from $7 to $9 per oz. *Imp.*, crude and oil, free.

Civil Engineer, a scientific man, one who attends to the business of engineering as applied to the economic or useful purposes of civil life.

Civita Vecchia. See ITALY.

Clack, in mining phraseology the valve of a pump; clack door being the aperture through which it is fixed and removed. — A bell that gives warning of more corn being required in a mill.

Chafter, a name given to the fathom of 6 feet in Germany, Russia, and Switzerland; in Hamburg it is only equal to 68 inches.

Clam, a well known mollusk, the *Mya arenaria*, which is very abundant on the coasts of New England and New York, especially in the gravelly mud of river mouths, between low water and half-tide mark. The shells, which are generally very hard, light-colored or sandy, and almost black on muddy bottoms, are dug up from their beds, which are exposed at low water, where they are found lying about one foot below the surface, their siphon (a retractile tube for respiratory and feeding purposes) projecting upward in the hole by which they communicate with the water at high tide. They are of importance as an article of food, and are also largely used for bait in cod and haddock fishing, for which purpose they are taken out of the shells, or "shucked," and salted down in barrels; about 5,000 barrels being put up every year, valued at from $6 to $7 each. As an article of food, the *C.*, excepting the soft mass called the belly, is rather indigestible, especially when cooked.

Clamp, a piece of wood fixed to the end of a board by mortise and tenon, or by groove and tongue, so that the fibres of the one piece, thus fixed, traverse those of the board, and by this means prevent it from casting; the piece at the end is called a *clamp*, and the board is said to be clamped. — A thick plank placed in a ship's side to support the ends of the beams. — A movable piece of lead to cover the jaws of a vice. — A kiln built above the ground, for the purpose of burning bricks in. — A mass of bricks piled up for kiln-burning. — A quantity of ore set apart for fusion.

Clamp-Nails, nails suited for clamp work.

Clamp-Shoes, heavy shoes for rough work.

Clapboards, a kind of thin weather-board used for the outer covering of houses. — Rough cask-staves before they are properly shaped.

Clap-Match, a fisherman's name for an old female seal

Clap-Net, a bird-catcher's net.

Clapper, the tongue or striker of a bell; a mill clack.

Clarence, a kind of close four-wheeled carriage.

Claret Wines [from *clairet*, a name in France for all rose-colored wines], the name first given in England to the red wines of Medoc, in France, but, by common use, extended there and in this country to all the red Bordeaux wines, even frequently including the white wines of the Gironde. The department of the Gironde, part of the ancient province of Gascony, is rich in the produce of the vine. In the quantity produced, in the variety, in quality and value, it stands the first district of France, and in a commercial point of view it is the most important. The extent of its vineyard ground is no less than 380,000 acres, of which 127,000 appertain to the arrondissement of Bordeaux, 15,000 to the arrond. of Bazas, 46,000 to the arrond. of Blaye, 84,000 to the arrond. of Libourne, 49,000 to the arrond. of Lesparre, and 59,000 to the arrond. of La Réole. Their total product of wine is about

65,000,000 gallons; a prodigious quantity, valued at no less than $10,000,000, of which one half in value is grown in the arrond. of Bordeaux and Lesparre alone. Of the total product of 65,000,000 gallons, 45,000,000 gallons are disposable, the rest is distilled or drank in the country. It is computed in France that a third more in quantity, beyond that grown in the Gironde, is exported from Bordeaux. This is drawn by the merchants from Spain, and from other depart. of France, and is mingled with the genuine wines of the Bordelais for the foreign market; it therefore must be added to the wines exported from the depart. The traffic in wine by sea from Bordeaux is very great, being nearly 11,000,000 gallons per annum, of which about 2,000,000 come to the U. States. An account of all the products of the vineyards of the Gironde, composing the extensive class of Bordeaux wines, is given in the following lines: —

The districts or arrondissements on the right bank of the river Garonne come first, one of which, that of Libourne, is situated on both banks of the river Dordogne, going from N.W to S.E. Of these districts, that of *Blaye* produces deeply colored wines. The wines of the canton of *Bourg* are particularly noted. They were once esteemed above those of Medoc, though now they rank in repute only with the inferior kinds of the latter class. In a good year they have strength, a fine color, and, by keeping, lightness; together with a taste of the almond. The wines of the *Palus* are grown on an alluvial land of that name situated between the Garonne and Dordogne. The Palus of Dordogne produces wines superior to those of Libourne, which are from a light soil, and of light quality. These latter wines are grown at Castillon, St. Foi, Branne, Coutras, and Guitres, in that arrond. The hill wines manuf. in that neighborhood are of a superior quality to the foregoing, such as those of *Lussac*, *St. Estèphe*, *Montagne*, *St Emilion*, *Cenon*, and *Barbe-Banche* Among this class, Cenon and St Emilion are most regarded. — The age of wine is reckoned in Bordeaux by *feuilles*, or leaves, the number of times the vine has flowered since it was planted. — The *St. Estèphe* wine has an aromatic, violet-flavored perfume. That of *Cenon* is fine, light, and spirituous. *St. Emilion* has plenty of body and superior flavor, and, as well as those of Bourg generally, Tourne, and their vicinity, acquires flavor by age, and a more perfect bouquet. The prime St. Emilion, Cenon, and Barbe-Blanche, above their 12th year, sell for 3 to 4 francs the bottle. — The arrond. of La Réole and that of Bazas produce only common wines. — The chain of high hills which extends itself along the right bank of the Garonne, from Ambares to the arrond. of La Réole, produces wines known as *vins de côtes*, which are good ordinary wines, and little more. The best are those of Bassens and Cenon. — The district styled the *Graves* composes another wine growth on the left bank of the Garonne, thus named from the gravelly soil, which is found extending 9 m. to the S., and 4 to the W. of Bordeaux. They are generally fuller in body, and more colored and vinous, than the wines of Medoc, but the last are preferred for bouquet and flavor. These agreeable red wines are kept 6 or 8 years in the cask, according to the temperature of the year in which they are made. They keep a long while, and in 20 years lose nothing of their good quality. The best qualities are grown at Merignac, Léognan, Pessac, Villeneuve-d'Ornon, and Talence. The first growth of Talence is *Chateau Haut-Brion*, 2 m. S.W. from Bordeaux. This wine is considered equal to that of the three first growths of Medoc. The wines of Haut-Brion are not bottled until 6 or 7 years after the vintage, though some of the first growths may be drank at 5 years old. The flavor resembles burning sealing-wax; the bouquet savors of the violet and raspberry Gradignan, Martillac, La Brède, Beautiran, Castres, St. Seive, and Portets, to the south of Bordeaux, furnish the wines known as the small red Grave wines (*petits vins rouges des Graves*) These are ordinary wines, some of which improve greatly by age. The merchants of Bordeaux comprehend under the foregoing name the common wines of Cauderan, Bouscat, Bruges, and Eyslnes, generally sold for consumption in that city. — The next and 4th district of the Bordelais is that of *Medoc*, the most important of all for its extent, and the quality of its produce. Its shape is that of a large triangle, of which the summit is acute, formed by the left bank of the Gironde close to its mouth, and the western shore of the ocean at the entrance of the gulf of Gascony The base is an oblique line, drawn from the left bank of the Garonne at La Teste, passing by Blanquefort. The Medoc district is an immense plain, divided on the side of the Gironde by small hills, which produce the best wine. These hills are covered with a light soil, intermingled with flints in great quantity, of an oval form, about an inch in diameter, and of a whitish gray color. At the depth of 2 feet a dry and compact red earth is found, intermingled also with flints. The second species of ground occupied by vineyards is a gravelly sand. At 18 inches from the surface, in some parts of this soil, is found a bottom of clay, or potter's earth; in other places dead sand; nowhere is the earth more varied in quality or in product. The estates are much divided. The *carbenet*, *carmenet*, *malbeck*, and *verdot* are the plants most cultivated in the plain of Medoc. The wine, when in perfection, should be of a rich color, a bouquet partaking of the violet, very fine, and of a very agreeable flavor. It should be strong without intoxicating; revive the stomach and not affect the head; leave the breath pure and the mouth fresh. A sea voyage, fatal to some of the best wines of France, does not alter the quality of these fine wines of the Gironde, but, on the contrary, it is observed to ameliorate those even of an inferior quality. The wines of Medoc, however, have their defects, one of the principal of which is, that most of them tend to decomposition in 16 or 17 years, though some growths will last 10 or 12 beyond either term. The first commune of Medoc, 6 m. from Bordeaux, descending the river, is *Blanquefort*, producing about 1200 tuns (a nominal measure of 4 casks of 60 gallons each), of which about 500 are white, generally known as white wines of the *Graves*. They are, for the most part, dry and agreeable, and do not want strength. The first growth of this district is *Dariste*, formerly Dulamon. The red wines have a good color, and they have a bouquet, which is not developed until they have been some time in bottle. The second commune, *Ludon*, produces 500 tuns of red wine, superior to that of Blanquefort. This superiority arises from the nature of the soil, which is gravelly for the most part *Macau* is the next commune, situated in a plain, two thirds of which are Graves, and one third Palus. The wine produced here is neither as agreeable nor racy as that of Ludon. It has, however, a deeper color and good body. *Labarde*, the next commune, generally gravel or sand, produces about 400 tuns of superior wine to that of Ma-

Fig. 81. — Wine-Cup of the Seventeenth Century.

(*From the Museum of Bordeaux.*)

cau, easily observable in its body, color, and bouquet. *Cantenac*, the fifth commune, is remarkable for the excellence of its wines, of which its product is about 2000 tuns. These wines are of exquisite taste, rivalling the best in Medoc, whether for the bouquet or raciness which characterize them, besides which they have color, body, and are agreeably aromatic. *Margaux* produces from 1000 to 1200 tuns. The soil of this renowned commune is gravelly, intermixed with a great number of flints. Its vines are the most esteemed in the whole tract. In this commune is grown the famous first quality, *Château Margaux*. In average years about 80 tuns of the first growth, and 20 of the second, are all which is made. The wines of Margaux, when in perfection, in a favorable year, have great fineness, a rich color, and a soft bouquet, which is balmy to the palate. They have strength without being heady, and leave the mouth cool. These wines are well known in America, though the wine of the first quality is rarely met with genuine in this country. It is in Margaux, also, that the wine called *Rausan* is produced. *St. Julien de Reignac*, in the arrond. of Lesparre, is the 18th commune of the Medoc vine country. It produces about 1200 tuns of wines, very inferior to those of Margaux. They have a peculiar bouquet, by which they are distinguished from all the other wines of Medoc. Kept 5 or 6 years in wood, they attain the character of good wines. The growths of *La Rose* and *Léoville* are the produce of this commune. The 19th commune is *St. Lambert*, producing 600 or 700 tuns of good wines, of nearly the same quality as those of St. Julien. In this commune is made the famous wine of *Château Latour*. This wine is distinguished from that of

Château Lafitte by its superior body and consistence; but it should be kept in wood at least a year more than the Lafitte to attain a proper maturity. This is the favorite wine in England; it is produced on a soil of sand and gravel, and in favorable years is nearly all purchased for the British market. Barely more than 100 tuns are made in the most abundant years, at least of the first quality. It is less fine than Lafitte. *Pouillac*, another celebrated commune of Medoc, produces from 3000 to 4000 tuns of a wine racy and full of bouquet. In this commune is grown the celebrated *Château Lafitte*, a wine surpassed by none of its rivals. About 100 tuns of the first quality only are annually produced, and 20 or 30 tuns of inferior growth. It is lighter than Château Latour, and may be drank somewhat less in age. The wine next in quality to Lafitte is that of *Mouton*, or Braune-Mouton, of which the produce is from 100 to 140 tuns. *St. Estèphe* produces 4000 tuns of wine, of a different quality from all the other Medoc wines. Light, agreeable, and aromatic, they are generally bottled after being 3 years in the cask. The vineyards of *St. Seurin de Cadourne* furnish about 3000 tuns annually of indifferent and very unequal wines in respect to quality.

The wines of the district of Haut-Medoc are all comprehended in the foregoing list. Those called in the country *le dernière du Haut-Medoc*, are St. Laurent, St. Sauveur, Cissac, and Verteuil, generally wines of tolerable quality. — The term Bas Medoc is applied to the wines grown in the communes of St Germain, Lesparre, St. Trélody, Potensac, Blaignau, Uch, Prignac, St. Christoly, Civrac, Bégadan, Gaillau, Queyrac, Valeyrac, Jau, and St. Vivien. The quantity of the whole produce varies from 5000 to 6000 tuns. These wines are, for the most part, touched with an earthy taste. In good years they are reckoned agreeable wines for exportation, when well selected, as their quality improves by age. — The wines of the first class in Medoc, including that of Haut-Brion, which is considered as such, sell for about 2500 francs per tun. Those of the 2d growth for 2200; of the 3d, 1700 to 2000; and of the 4th, 1200 to 1500. The prices augment annually until the 5th year, when they are generally double the first. — The vines in Medoc and Graves are planted at a distance of 3 feet from each other every way. The main stem of the plant is only allowed to attain a foot in height, and is fastened to stakes of the same dimensions. To the stakes are joined laths or switches, 10 or 12 feet long, horizontally, on which are laid 1000 branches of each vine, left when it is pruned for that purpose. The plough is applied four times to the intervals between the rows. The grapes are thus prevented from touching the ground, when proper attention is paid to keeping the branches fastened to the laths, and they receive both the direct and reflected heat of the sun when they are properly pruned. This is considered the most perfect method known for the cultivation of the vine. — Here the account of the red wines of this fertile district must end; in *white wines*, the depart. of the Gironde is less rich. At Blaye, Libourne, and La Réole, the white wines are of a very common quality. Bazas produces more white wine than red. The best are produced at Fargues, Langon, St Pardon, St. Pierre de Mons, Toulenne, and, above all, at *Bommes* and *Sauterne*. The best white wines of the arrond. of Bordeaux are grown in the *Graves*, and in the southern part near Bazas, as far as the canton of Podensac in the communes of Barsac, Preignac, Cérons, Podensac, Virelade, Illats, Landiras, Pujols, to which may be added St Croix du Mont. The white wines of a superior quality are divided into dry and luscious, and those again into first and second growths. The dry are generally the product of the Graves. The first in quality are *Carbonieux*, *St Brice*, *Château du Lamont*, *Pontac*, *Sauterne*, *Bommes*, *Barsac*, and *Preignac*. The second growths are Cérons, Podensac, Virelade, Illats, Landiras, Pujols, St Pey de Langon, St Croix du Mont. The first growths of both kinds are sold at about 1200 francs, the second growths at 700. But the price augments with age, so that at 10 years old the wines of Sauterne, Bommes, Barsac, and Preignac sell often at 2000 francs, and sometimes as high as 3000 or 4000 per ton. — To obtain the more luscious wines, it is requisite that the raisins be, in the language of the wine-makers, *pourri*, or rotten, or in such a state that the skin be detached from the pulp on the slightest pressure. As all the grapes on the same plant cannot be in this state at once, 4 or 5 different gatherings, or rather cuttings, of the ripe grapes take place as they reach the requisite state, for which purpose the scissors are used. — The unadulterated wines of the Gironde most held in estimation in the U. States are equalled by other varieties in the depart., some of which are rarely imported into this country. No district in the world surpasses the present in the excellence of its growths, and the variety of its products. The consequence is, that frequently the Bordeaux merchants export much larger quantities of wine of first growth than the country produces, by substituting other kinds, which nearly approach in excellence those of which they are counterfeits. Gorce, Branne, Mouton, La Rose, Rozan, and others, in good years, make very close approaches in quality to the best products of the Bordelais.

Clarify, to clear or fine a liquor by a chemical process.

Clarinet, a musical reed instrument, larger than the oboe, and like it played by holes and keys.

Clary-Water, a spiced and highly perfumed sweet cordial or medicinal drink, made from the flowers of the clary (*Salvia sclaria*), which is a stimulant aromatic bitter.

Clasp, a fastening.

Clasp-Knife, a large folding knife for the pocket, or one to suspend by a cord to the neck.

Clasp-Nails are nails with small, narrow-shaped heads, so as to sink in the wood.

Clavicembalo [It.], the harpsichord.

Clavier, the key-board of an organ or piano.

Claviole, a finger-keyed viol.

Clavoyon. See BURGUNDY WINES.

Clay, an aluminous or argillaceous earth formed from the disintegration of felspathic rocks, by the combined action of air and water. Its plasticity, when moist, and its capability of being made hard by heat, are properties which render it available for many useful purposes. The purest kind of *C.* is kaolin or china *C.*, which is nearly pure silicate of alumina. It is found in China; but a precisely similar substance is obtained from deposits near St. Austell, in Cornwall, and St. Yrieix, near Limoges, in France. Such clays are obtained in this country at Brunswick, Maine, at Haddam, Connecticut, and other places. *Pipe C.* is a white clay nearly free from iron. See SMOKING PIPES. — Common *potter's C.* contains a considerable amount of iron. In New Jersey, near Woodbridge, and also at South Amboy, beds of clay are worked to a great extent for the manufacture of stone-ware. Similar deposits also compose the banks of the Delaware River, between Bordentown and Burlington. They all belong to the series of upper secondary rocks, underlying the green sand-beds. *Brick C.* contains varying proportions of iron; hence different countries build houses of different colors. *C.* beds found in Wisconsin, near Lake Michigan, are so free from this coloring matter, that the bricks are of a straw color. They are so much esteemed as to be transported from Milwaukie to New York City. *Imp.* duty, $5 per ton.

Clayed, a term applied to sugars which have been purified or bleached by water filtered through superimposed clay.

Claying, a process of bleaching sugar by water passed through a layer of clay; also the operation of puddling.

Clay-Kiln, a stove for burning clay.

Clay-Pipe. See SMOKING PIPES.

Clay-screening Machine, a machine for preparing clay for the manufacture of bricks, tiles, pipes, etc.

Clay-Stone, a grayish mineral, a species of indurated clay, resembling calcareous marl.

Clean Proof, a slip or sheet of printed matter sent to an author from a printer.

Clearance, a document from a Custom-House officer, or other qualified person, permitting a ship to depart on her voyage.

Clearing, a removal, as a clearing sale; an open space in forest land.

Clearing-Beck. See CALICO-PRINTING.

Clearing-House is an institution whose object is to facilitate the settlement of balances and the adjustment of exchange operations between banks and bankers of the same place, who are admitted to deal with it. "The *C. H.* of London, the first of its kind, originated among the bankers of that city, whose transactions in the checks, bills, and drafts drawn upon each other became so large as to call for the daily and even hourly use of vast sums in bank-notes by all of them. Appreciating how readily the debits and credits respectively due

or held by them might be set off the one against the other, they formed the clearing-house, where up to 4 o'clock each day all drafts, bills, etc., drawn upon each individual member were taken. The system of the London *C. H.* has recently been much extended and improved, and all balances are settled by checks drawn upon the bank of England, — no bank-notes being required at all. *C. H.* exist in New York, Philadelphia, Boston, and other cities of the U. States. The system in that of Philadelphia is equal and in some respects superior to that of any other in the U. States. The clearings are made each morning at 8.30, just before which hour a messenger and a clerk from each bank are at the *C. H.* The clerks take their seats inside a series of desks arranged in the form of a hollow oval. Each messenger brings with him from his bank a sealed package for each other bank, containing all the checks or drafts on such bank. The name of the bank sending and that of the bank to which it is sent are printed on each package, and the amount sent is written thereon. The messengers take their places near the desks of their respective banks, and they have with them tabular statements of the amount sent to each bank and the aggregates. These are exhibited to the respective clerks and noted by them on the blank forms. At 8.30 precisely the manager calls to order and gives the word, when all the messengers move forward from left to right of the clerks, handing in to those clerks the packages addressed to their respective banks, and taking receipts for them on their statements. When the circuit is completed all the packages have been delivered and received, and the amounts and the aggregates, both debtor and creditor, noted by the clerks. When the clerks find all correct the messengers take the packages received, and return to bank. The several clerks then pass round a memorandum of the debits, credits, and balance, each of his respective bank. When these memoranda have made the circuit, each clerk has on his statement the debits, credits, and balance, whether debtor or creditor, of each bank. If these debits and credits and debtor and creditor balances are found to balance, the clerks now leave the *C. H.* If not, they remain until the error or errors are discovered. The balances due by the several banks are paid in to the *C. H.* that day by 11.30 A.M., and are receivable by the creditor banks by 12.30 P.M.

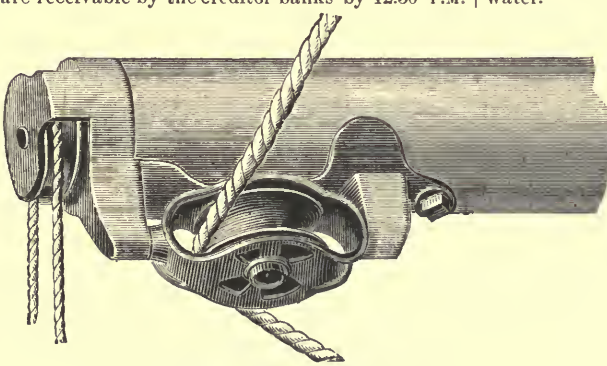


Fig. 82. — GAFF TOPSAIL CLEAT.
(Patented by Bagnall & Loud, Boston.)

A second clearing of drafts, etc., received by the morning's mail, is made at the clearing-house by the messengers at 11.30 A.M. Each bank is obliged daily to furnish to the *C. H.* a statement of its condition at the end of business hours on that day; and tables are daily furnished to the several banks of the condition of all the banks in the *C. H.* Complete records of all the transactions, of the state of the banks, etc., are preserved in the books of the *C. H.*, precisely as are the business transactions of any bank, or other corporation or mercantile firm." — *American Cyclopædia.* The New York *C. H.* consists of 58 banks and the Assistant Treasurer of the U States. Its aggregate transactions from its organization on Oct. 11, 1853, to Jan. 1, 1879, amounted to $51,516,058,588.94.

Statement showing the New York C. H. Transactions for each month, from January 1st to December 31st, 1878, with the Loans, Specie, Legal Tenders, and Liabilities of the Associated Banks, and the Per Centage of Specie and Legal Tenders to Net Liabilities.

	Currency exchanges.	Currency balances.	Loans.	Specie.
	$	$	$	$
Jan....	1,761,157,037.96	87,954 303.85	238,404,300	30,193,600
Feb....	1.304,793,460.16	65,556,319.89	243,659,100	32,379,400
Mar....	1,630,966,739.20	74,407,670.17	241,590,900	38.767,600
Apr....	1,812,432,039.85	77,327,098.01	230,301,500	32,585,100
May....	1,664,424,017.78	86,635,501 33	233,997,200	19,827,100
June...	1,538,777,981.61	73,667,713.42	232,720,200	16,311,900
July...	1,631,328,390.25	88,697,412.08	238,636,000	19,695,600
Aug....	1,533,464,482.44	74,896,697.25	239,431,700	17,000,300
Sept....	1,460,563,646 59	72,694,718.13	246,322,500	18,199,600
Oct....	1,979,541,899,55	90,245,565.05	245,108,400	19,860,500
Nov ...	1,836,123,632.37	83,059,470.44	236,438,400	22,967,400
Dec. ...	1,705,097,979.13	87,712,178.28	235,824,400	20,514,100

	Legal Tender.	Net Deposits and Circulation.	Per Centage of Legal Tenders to Net Liabilities.	Per Centage of Specie to Net Liabilities.
Jan	$37,231,200	$226,969,300	16.40	13.30
Feb.........	32.379,400	230,701,500	14.73	14.04
Mar	29,425,400	230,290,700	12 78	16.83
Apr.........	34,923,800	220,896,800	15.81	14.75
May.........	44,023,900	218,991,100	20 10	9.05
June.......	53,996,300	225,899,800	23.90	7.22
July.......	58,409,600	222,133,700	24.22	8.17
Aug.........	53,948,500	235.602,800	22 85	7.21
Sept........	45.680,700	216,332,000	19 36	7 71
Oct.........	39,962,500	230,986,400	17 30	8 58
Nov.	41,275,700	226,804,200	18 19	10.12
Dec.........	40,767,100	222,786,400	18.30	9.21

Clearing Nut, a name given to the seed of *Strychnos potatorum*, from its property of clearing water.

Clearing-Sale, a disposal of stock, remainder, or rummage.

Clear-Starcher, a laundress who washes fine linens and stiffens them with starch.

Cleat, a short, narrow strip of wood, fastened to a piece of timber-work, to hold it in a certain position. — On board ship, a kind of belaying pin, of which there are several forms (Fig. 82), to fasten ropes to.

Cleaver, a name in some places for a hatchet, but principally applied to a butcher's metal axe or chopper.

Cledge, a mining term for the upper stratum of fuller's earth.

Cleet, a wedge or belaying pin.

Cleft, a space or opening made by a wedge, etc.

Clenching, Clinching, the process of fastening securely, as in doubling over the point of a nail when it has passed through a plank.

Clerk, an assistant in a shop or store, who acts

as a salesman, etc.; one who attends only to a part of the business of a merchant, while the merchant himself superintends the whole; an accountant. In its primary sense, *C.* was the legal appellation of a clergyman. The clergy being exclusively the learned part of the community of the Middle Ages, the word hence came to signify an educated person; and thus acquired the sense of a scribe or writer in France and England.

Cleveland, a city and lake-port of the U. States, cap. of Cuyahoga Co., in the State of Ohio, and, next to Cincinnati, the largest and most important city in the State, is situated at the mouth of Cuyahoga River, on the S. shore of Lake Erie, in lat. 41° 30′ N., lon. 81° 47′ W., 255 m. N.E. of Cincinnati, 195 m. S.W. of Buffalo, and 135 m. E.N.E. of Columbus. The city is built on both sides of the river, which is here crossed by several bridges, and chiefly on a plain from 50 to 100 feet above the lake, of which a magnificent view is thus obtained. *C.* has important commercial advantages. Five railroads pass through or terminate in the city, — including the Lake Shore and Michigan Southern, one of the great trunk lines between the East and the West; a division of the Atlantic and Great Western, a leading channel of communication between the East and the Northwest; and the Cleveland, Columbus, Cincinnati, and Indianapolis, a direct line to Cincinnati and the South. Other lines afford communications with the extensive coal and petroleum regions of Pennsylvania. *C.* is the northern terminus of the Ohio Canal, which extends southwards to Portsmouth on the Ohio River. For the accommodation of the lake commerce a capacious harbor has been formed at the mouth of Cuyahoga River by extending two piers, 200 feet apart, 1,200 feet into the lake. The city has an extensive trade in copper and iron ore shipped from the Lake Superior mining region, and in coal, petroleum, wool, and lumber, received by railroad, canal, and lake transportation. In 1878 the number of vessels entered in the coastwise trade was 2,023 (of which 1,067 were steamers), having an aggregate tonnage of 1,199,463; 2,850 vessels of 1,216,626 tons cleared. The foreign commerce, which is exclusively with Canada, is considerable, — the imports amounting in 1878 to $146,385, and the domestic exports to $888,255; 522 vessels of 115,131 tons entered in this trade, and 663 of 178,022 tons cleared. The total number of vessels registered, enrolled, and licensed in the district was 227 of 73,253 tons. Eight vessels of 1,933 tons were built during the year. About $25,000,000 of capital are invested in manufactures, the most important industries being those of iron and the production of refined petroleum. There are also several pork-packing establishments and breweries. The city contains 7 national banks with a capital of $4,400,000, 7 private banks with a capital of $32,854, and 2 savings banks. Pop. in 1870, 72,829; actual pop. about 140,000.

Cleveland R.R. Cos. See Appendix.

Clew, the lower corner of the sail of a ship.

Clew-Garnets, Clew-Lines, brails or rope tackle to hoist up the ends of ships' sails to the yards.

Clicker, in the shoe trade, a cutter-out of leather for the uppers and soles of boots and shoes. — In the printing profession, one who, under the overseer, has the charge of any particular work, making up and imposing the matter, and presenting it to the reader in a proper form for revisal.

Client, a customer; usually applied to those who deal with bankers, brokers, and attorneys.

Clinch, a nautical term for a half hitch, stopped to its own part.

Clinched-Work, planks laid to overlap each other in the manner of slating roofs. Boats built in this manner are termed *C.*, or clinker built.

Clinker, the accumulated cake or refuse of coal, a vitreous scoria which forms in grates or furnaces. — An exceedingly hard Dutch or Flemish brick, 6 inches by 3 broad, and 1 thick, used for paving yards and stables. *C.* are more thoroughly burnt than ordinary bricks.

Clink-Stone, a grayish-green mineral, consisting of felspar and zeolite, yielding a metallic sound under the hammer. It occurs in volcanic districts, and is remarkable for its tendency to lamination, which is sometimes such that it affords tiles for roofing.

Clinometer, a surveyor's instrument for measuring the slopes of cuttings and embankments, and ascertaining the dip of strata.

Clinquant [Fr.], orsedew or Dutch gold-leaf.

Clip, the wool sheared from a sheep. — A clasp or spring-holder for letters and papers.

Clip-Fish, also called Baccalau, a name in Norway, and some other countries, for codfish, salted and dried in the manner of the Newfoundland cod.

Clipper-Ship, a fast sailing vessel, one built on fine, sharp lines, and adapted more for fast sailing than for carrying large cargo.

Clit-Bur, a common name for the burdock (*Arctium lappa*), all the parts of which have some medical properties.

Clivers, or **Cleavers**, the *Galium aparine*, sold by herbalists as a diuretic and sudorific. The root dyes red.

Clives, a hook with a spring to prevent its unfastening.

Cloak, a large, loose wrapper of cloth or other material.

Cloaking, a woollen dress material, of which there are plain, mixture, and fancy kinds.

Cloak-Pin, a brass or iron pin to hang garments on.

Clobberer, the lowest class of cobblers, who patch and botch up shoes and boots, rubbing in ground cinders and paste, termed "clobbed," into the crevices and breaks of the leather.

Clock [Fr. *horloge*; Ger. *Uhr, Grosse-uhr*; It. *orologgio, oriuolo*; Sp. *reloje*], a kind of machine, put in motion by a gravitating body called a *pendulum*, and so constructed as to divide, measure, and indicate successive portions of time with great accuracy. Most *C.* mark the hour by striking or chiming. It is a highly useful instrument, and is extensively employed for domestic and philosophical purposes. *C.* are made of an endless variety of materials and models, so as to suit the different uses to which they are to be applied, and the different tastes of their purchasers. Their price consequently varies from a few dollars to more than $500. The Germans and Dutch are particularly celebrated for their skill in the manufacture of wooden clocks, while the French, Genevese, and English have carried the art of making metallic clocks, so as to keep time with the greatest precision, to a high degree of perfection. Ornamental *C.* are imported into the U. States from France and Germany. Cheap wooden and metallic *C.* are extensively made in New York, New Jersey, Illinois, and other States, and are exported to all parts of the world, but chiefly to England and Japan. The value of *C.* exported in 1878 was $936,003, in which total England enters for $427,891, Japan for $95,611, and Australia for $63,336. *Imp.* duty, *C.* of all kinds, and parts of, 35 per cent.

The general construction of the going part of all house *C.* is substantially as represented in Fig. 83, which represents a pendulum or weight clock. B is the barrel with the rope coiled around it generally 16 times for eight days; the barrel is fixed to its arbor, D, which is prolonged into the winding square coming up to the face or dial of the *C.*, which is not represented in the diagram. The great wheel, C, is part of the barrel, rides with it on the arbor, and drives by a pinion a second wheel, E The wheel, E, drives the pinion, F, which is called the centre pinion, on the arbor of the *centre-wheel*, K, which goes through to the dial, and carries the long or minute-hand. This wheel always turns in an hour, and the great wheel generally in 12 hours, by having 12 times as many teeth as the centre pinion. The centre-wheel drives the wheel, G, by its pinion, H, and the scape-wheel, M, by its pinion, L. If the pinions, L and H, have each eight teeth, or *leaves* (as the teeth of pinions are usually called), K will have 64 teeth, and G 60, in a clock of which the scape-wheel turns in a minute, so that the second-hand may be set on its arbor prolonged to the dial. N represents the pallets of the escapement, which will be described presently, and their arbor, O, goes through a large hole in the back plate to the upper part of the *crutch*, S, ending in the *fork*,

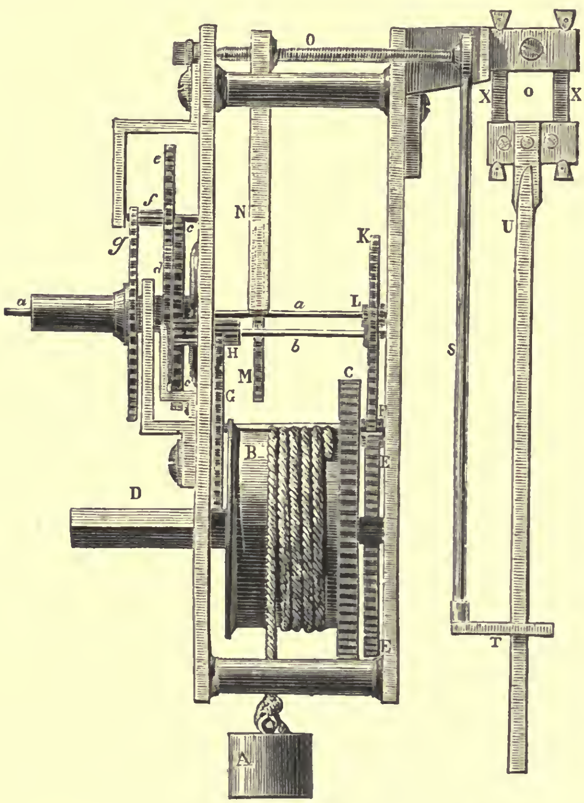


Fig. 83. — Section of Pendulum or Weight Clock.

T, which embraces the pendulum, U, so that, as the pendulum vibrates, the crutch and the pallets necessarily vibrate with it. The pendulum is hung by two thin springs, X X. We may now go to the front, or left hand, of the clock, and describe the dial, or " motion-work " The minute-hand fits on to a squared end of a brass socket, which is fixed to the wheel, *c*. and fits close, but not tight, on the prolonged arbor of the centre-wheel. Behind this wheel is a bent spring, which is (or ought to be) set on the same arbor with a square hole in the middle, so that it must turn with the arbor. The consequence is, that there is friction enough between the spring and the wheel to carry the hand round, but not enough to resist a moderate push with the finger for the purpose of altering the time indicated. This wheel, *c*, is sometimes called the minute-wheel, but is better called the *hour-wheel*, as it turns in an hour. Near the wheel, *c*, and on the same hollow arbor, is a second wheel, *d*, which drives a wheel, *e*: the arbor of the wheel *e* has a pinion, *f*, and that pinion drives the twelve-hour wheel, *g*, which is also attached to a large socket, or pipe, carrying the hour-hand.

The weight, A, which drives the train and gives the impulse to the pendulum through the escapement, is generally hung by a catgut line passing through a pulley attached to the weight. It has usually been the practice to make the case of house clocks and astronomical clocks not less than 6 feet high; but that is a very unnecessary waste of space and materials; for, by either diminishing the size of the barrel, or the number of its turns, by increasing the size of the great wheel by one half, or hanging the weights by a treble instead of a double line, a case just long enough for the pendulum will also be long enough for the fall of the weights in $7\frac{1}{2}$ or 8 days. Of course, the weights have to be increased in the same ratio, and indeed rather more, to overcome the increased friction.

Clock-Case, the wooden or other framing in which the clock-work or machinery is fixed; an old-fashioned tall case for enclosing a pendulum clock.

Clock-Dial, the face of an elevated or turret clock, on which the figures are marked, and over which the pointing hands or indicators travel.

Clock-Face, the enamelled dial of a house or turret clock.

Clock-Hands, the metal revolving pointers which traverse the clock-face.

Clock-Making Machines, wheel-cutting engines, and other special machines used to facilitate the manufacture, and cheapen the cost of clock-work.

Clock-Work, the wheels and various complicated machinery for the interior of a clock.

Clod-Crusher, a heavy roller for pressing down and smoothing the surface of land.

Cloff, a further reduction of 2 lbs. in every 3 cwt., on certain goods, after the tare and tret are taken. It is an allowance now almost obsolete.

Clogs, heavy wooden shoes worn in Europe, principally in tanneries and other manufactories where the feet are exposed to wet; also lighter raised supports for the feet, worn by females.

Clog-Soles, thick soles of wood for clogs, of which about $2\frac{1}{2}$ millions are made in the northern counties of England, chiefly for workmen.

Clos Bernardon, Clos de la Perrière, Clos du Roi. See Burgundy Wines.

Close-Dealing, exacting; shrewd or tight bargaining; just within the limits of fairness or honesty, — sometimes a little *over* the line. — *T. McElrath.*

Close-Hauled, a marine term applied to a vessel with her yards brailed up, and sailing as near to the wind as possible.

Close-Stool, a bedroom commode for invalids.

Closet, a cupboard, a place for keeping articles in; also a small private room.

Closh-Hook, a whaler's implement for lifting blubber to be skinned.

Closing an Account, balancing the items by an adjustment of the debtor and creditor sides.

Clos Pitois, Clos Tavannes, Clos Vougeot. See Burgundy Wines.

Cloth, a manufactured substance, consisting of wool, hair, cotton, flax, and hemp, or other vegetable filaments. It is formed by weaving or interlacing threads, and is used for making garments or other coverings. The term cloth, when used alone, is generally employed to distinguish woollen cloth from fabrics made of any other textile material.

Clothes, Clothing, are general names for whatever covering is worn, or made to be worn, for de-

cency or comfort; garments; personal attire; dress; apparel; vestments.

Clothes-Brush, a stiff hair-brush, used for brushing garments of cloth.

Clothes-Horse, a wooden frame to hang garments or linen on before a fire.

Clothes-Line, small, strong cord used in gardens, etc., for suspending wet clothes on to dry.

Clothes-Peg, wooden divided pegs, used by laundresses to secure washed linen on a line to dry.

Clothes-Press, a wardrobe or cupboard for hanging clothes in.

Clothes-Wringer. See WRINGING-MACHINE.

Clothier, in England, a maker of, or dealer in, cloth or clothes; in the U. States, a maker or seller of clothes.

Clothing. See CLOTHES.

Clothing-Wool. See WOOL.

Cloth-Papers, coarse papers, glazed and unglazed, for pressing and finishing woollen cloths.

Cloth-Shearer, a workman employed to remove the imperfections of woollen fabrics after weaving; this is now done to a great extent by cloth-shearing machines.

Cloud-Berry, a name for the fruit of the *Rubus chamæmorus*, which is acid and pleasant to the taste. The Scottish Highlanders and the Laplanders esteem it as one of the most grateful and useful fruits.

Clouding, an appearance given to ribbons and silks in the process of dyeing.

Clough, an engineering appliance for dividing the fall of water into two parts applicable to drains in tideways, etc.

Clous, the French name for nails.

Clout, an iron plate placed on an axletree, or on a piece of timber in a carriage, to keep the wood from being worn by taking the rubbing.

Clouted Shoes, heavily nailed shoes, which, in Europe, are worn by agricultural laborers, carters, etc.

Clouterie [Fr.], a manufactory for nails.

Clout-Nails are heavy nails with large head. In American manuf. they are made of 9 sizes, from ¾ inch to 2 inches, and are sold put up in pound papers, or in bulk. A full box consists of 100 lbs.

Clove, an English weight for wool, equal to 7 lbs., or the half of a stone. — Also a long spike-nail.

Clove-Bark, a commercial name given to the barks of two different trees, — one being the *Cinnamomum culilaban*, growing in the Eastern Archipelago, and the other the *Dicypellium caryophyllatum*, found in Brazil.

Clove-Hitch, two half hitches round a spar or rope.

Clove-Nutmegs, Madagascar-Nutmegs, Ravensara-Nuts, the produce of *Agathophyllum aromaticum*, found in Madagascar, where they are used as a spice, and from thence occasionally exported to France.

Clover [Fr. *trèfle, luzerne*; Ger. *Klee*; It. *trifoglio*; Sp. *trebol*], one of the most important of artificial grasses for fodder, of which there are many varieties. The seed of the American red *C.* is an important article of commerce and export, chiefly to England.

Cloves [Chinese *tsz'ting hiang*; Dutch *kruidnagelen*; Fr. *clous de girofle, girofles*; It. *chiovi di garofana, garofani*; Port. *craros da India, craros girofes*; Sp. *clavos da especia, clavillos*], the unexpanded flower-buds of the clove-tree, *Caryophyllus aromaticus*, which form a well-known spice. The clove-tree is a native of the Moluccas. Though its native range was limited, it grew abundantly in all the islands; but the Dutch succeeded in extirpating the plant in all the islands, except Amboyna and Ternate, so as to secure its monopoly. A Frenchman, however, one Poirie, the governor of Mauritius and Bourbon, contrived to export several trees to the islands under his government: thence they have spread to Cayenne and the West Indies, to Brazil, to Sumatra, and Zanzibar. *C.* are shaped like a nail; whence the name, from the French *clou*, nail, about 6 lines long, plump and heavy. They are chiefly imported from the Dutch settlements; the best in chests, and an inferior kind in bags. The best variety of the Amboyna *C.* is smaller and blacker than the other varieties, very scarce, and, as a mark of pre-eminence, is termed the Royal *C.* Good *C.* have a strong, fragrant, aromatic odor, and a hot, acrid, aromatic taste, which is very permanent. They should be chosen large-sized, perfect in all parts; the color should be a dark brown, almost approaching to black; and, when handled, should leave an oily moisture upon the fingers. Good *C.* are sometimes adulterated by mixing them with those from which oil has been drawn; but these are weaker than the rest, and of a paler color; and whenever they look shrivelled, having lost the knob at the top, and are light and broken, with but little smell or taste, they should be rejected. As *C.* readily absorb moisture, it is not uncommon, when a quantity is ordered, to keep them beside a vessel of water, by which means a considerable addition is made to their weight. *C.* contain a very large amount of volatile oil, the quantity being nearly 20 per cent. They are also, it is said, very rich in tannin. Every portion of the tree is aromatic, and has been subjected to distillation. The use of *C.* in cooking is familiar to every one; but they enter, also, largely into perfumery, and are used in the Pharmacopœias of this country and England. This article, once so scarce and precious, is now very cheap, the price of *C.* in New York being about 35 cts. per lb. About 200,000 lbs. are annually imported into the U. States. *Imp.* duty, 5 cts. per lb.

Mother of C., the unripe fruit of the *C.* tree. They are sometimes imported preserved, and are reported stomachic and antispasmodic.

Oil of C. possesses similar virtues to the unexpanded flower-buds. It is used to flavor liquors and confectionery, and also in perfumery. Sp. gr. 1.055 to 1.060. *Imp.* duty, $2 per lb.

C. Stalks, or *Stems*, the dried stems bearing the flower-buds. They are used as a cheap spice, but are chiefly imported for adulterating other spices. *Imp.* duty, 3 cts. per lb.

Club, a short, heavy, massy stick, which is the official arm of policemen in this country and England.

Clubbing, uniting together for some object. — A sea term for a vessel drifting down a current with an anchor out.

Club Compasses, a pair of compasses having a bullet or cone on one leg to set in a hole.

Clue, Clew, the lower corner of the square sail of a ship; hence the ropes by which it is lined are called clue-garnets, or clue-lines.

Clump-Boots, heavy boots for rough wear, such as shooting, excavators' work, etc.

Clunch or **Curl-Stone**, a local name in Staffordshire, England, for a mineral substance from which tripoli is made.

Clutch, an apparatus for engaging or disengaging two shafts; it consists of two pieces of metal formed so, that, when placed together, pro-

jecting pieces on one (made to slide to and fro on the shaft, but turn with it) fit into recesses in the other, which is fixed on the driving shaft, so that the first being pulled back, its shaft will remain at rest. The common *C.* or gland, represented in Fig. 84, has a loose band-pulley, P, which, revolving freely upon the shaft, A, except when it is shifted by the lever, E, engages its projections with the gland, D, which is firmly keyed to the shaft.

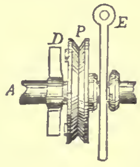


Fig. 84.—Clutch.

Clyster-Pipe, a medical instrument for injecting into the rectum.

Co., an abbreviation for company, as H. A. Curtin and Co.

Coach, a pleasure carriage, distinguished from a chariot by having seats fronting each other; a close four-wheeled vehicle, of which there are many kinds. See Carriage.

Coach-Maker, a carriage-builder.

Coaking, in mast-making a process of joining or uniting timber to the inside spar. Generally the word implies a union of two pieces of wood, by letting in a small projection of one piece into the hollowed end of the other.

Coal [Dutch, *steenkoolen;* Fr. *charbon de terre;* Ger. *Steinkohlen;* It. *carboni fossili;* Port. *carvoes de terra;* Sp. *carbones de tierra*, or *de piedra*]. There are several varieties of *C.*, all of which appear to have been formed by the action of certain chemical forces on wood or other vegetable matter; but these varieties may for the most part be arranged into two groups, the one containing no bitumen, and the other distinguished by the presence of that substance. In the first variety, or that without bitumen, is *anthracite*, also called *glance coal* and *stone coal* (see Anthracite). In some varieties of anthracite, however, bitumen is present, in which case it burns with a considerable flame Indeed, anthracite passes gradually into bituminous coal, which varies greatly according to the amount of bitumen.

The following are recognized varieties: — *Caking* or *pitching C.* breaks into small pieces when heated, but on raising the heat they unite or *cake* into a solid mass. Its color is velvet or grayish black. It burns with a lively yellow flame, but requires frequent stirring to prevent it from caking and so clogging the fire. *Cherry C.* resembles caking *C.*, but does not soften and cake; it is very brittle, and burns with a clear yellow flame. The *splint C.* is harder than cherry coal. *Cannel C.* burns readily without melting. It is of compact and even texture, little lustre, and breaks with a large conchoidal fracture. *Brown C.*, *wood C.*, and *lignite* are imperfect varieties of *C.*, usually of a brownish black color, and retaining the structure of the original wood, and burning with an empyreumatic odor. The substance termed *jet* resembles cannel *C.*, but is harder, of a deeper black color, and higher lustre. It takes a brilliant polish, and is sometimes set in jewelry. Mr. Hutton (*Proceedings of the Geological Society of London*) has given decisive proof of the vegetable origin of *C.*, by submitting to microscopic examination an extensive series of slices taken from the several varieties of *C.* found at Newcastle. He considers this *C.* to be of three kinds: the first, which is the greatest in quantity and the best in quality, is the rich *caking C.*, so generally esteemed; the second is *cannel* or *parrot C.* (*splint C.* of the miners); and the third, *slate C.*, consisting of the two former arranged in thin alternate layers with a slaty structure. In these varieties, taken indiscriminately, more or less of the vegetable texture could always be discovered, thereby affording the fullest evidence of the vegetable origin of *C.* Each of these three kinds of *C.*, besides the fine distinct reticulation of the original vegetable texture, exhibits other cells which are filled with a light wine-yellow-colored matter, apparently of a bituminous nature, and which is so volatile as to be entirely expelled by heat before any change is effected in the other constituents of the coal. The number and appearance of these cells vary with each variety of *C.* In caking *C.*, the cells are comparatively few, and those which do exist are highly elongated. Their original form the author believes to have been circular, and he attributes their present figure to the distension of gas confined in a somewhat yielding material subject to perpendicular pressure. In the finest portions of this *C.*, where the crystalline structure, as indicated by the rhomboidal form of its fragments, is most developed, the cells are completely obliterated. In such parts the texture is uniform and compact; the crystalline arrangement indicates a more perfect union of the constituents, and a more entire destruction of the original texture of the plant. The slate *C.* contains two kinds of cells, both of which are filled with yellow bituminous matter. One kind is that already noticed in caking *C.*; while the other kind of cells constitute groups of smaller cells of an elongated circular figure. In those varieties which go under the name of cannel, parrot, and splint *C.*, the crystalline structure, so conspicuous in fine caking *C.*, is wholly wanting, the first kind of cells is rarely seen, and the whole surface displays an almost uniform series of the second class of cells, filled with bituminous matter, and separated from each other by their fibrous divisions. Mr. Hutton considers it highly probable that these cells are derived from the reticular texture of the parent plant, rounded and confused by the enormous pressure to which the vegetable matter has been subject. The author states that though the crystalline and uncrystalline, or perfectly and imperfectly developed varieties of *C.*, generally occur in distinct strata, yet it is easy to find specimens which in the compass of a single square inch contain both varieties. From this fact, as also from the exact similarity of position which they occupy in the mine, the differences in different varieties of *C.* are ascribed to original differences in the plants from which they are derived. Geological examinations of *C.*-fields have also afforded abundant evidence of the vegetable origin of *C.*, although the manner in which the *carboniferous strata* (as the *C.-measures*, or assemblage of rocks which include *C.*, are termed) have been deposited is by no means agreed upon. Some geologists suppose that the *C.*-measures were originally peat-bogs, and that the successive layers were occasioned by repeated subsidences of the land; others contend that the vegetable matter originated from *rafts*, like those of the Mississippi, which floated out to sea and there became engulfed; a third opinion is, that they were formed in vast inland seas or lakes, the successive beds of vegetable matter being supplied by periodical land-floods. If we trace the series of which a *C.*-field is composed, beginning with the lowermost stratum, we have: — 1. a tough, argillaceous substance, which changes upon drying into a gray, friable earth; it is sometimes black, from the presence of carbonaceous matter, and contains innumerable stems of Stigmaria; 2. then comes the coal, in which the external forms of plants, etc., are obliterated by bitumini-

zation, although the internal structure remains; 3. the *roof*, or upper bed, which generally consists of slaty clay, abounding in leaves, trunks, stems, branches, and fruits, and often containing layers of ironstone nodules, in which leaves, insects, crustacea, etc., are imbedded. Interstratified with the shale, finely-laminated clay, micaceous sand, grit and pebbles of limestone, granite, sandstone, and other rocks, often occur. In fact, this bed appears to be an accumulation of drifted materials, mingled with the dense foliage and stems of a prostrate forest. These phenomena may be explained by supposing the inundation of a thickly-wooded plain by an irruption of the sea, or a vast inland lake, occasioned by the sudden removal of some barrier, or by a subsidence of the tract of country on which the forest grew. But when we find an accumulation of strata, in which triple deposits of this kind are repeated some thirty or forty times through a thickness of many thousand feet, a satisfactory solution of the problem is very difficult. Not only subsidence after subsidence must have taken place, but the first submergence have been followed by an elevation of the land — another soil fit for the growth of forest trees been produced — another generation of vegetables of precisely the same species and genera have sprung up, and arrived at maturity — and then another subsidence, and another accumulation of drift. And these oscillations in the relative level of the sandstone or limestone, and the middle filled up by strata superior to the *C.*-measures, viz., magnesian limestone and new red sandstone. The internal upheaving force, whatever it may have been, which converted the horizontal strata into basin-shaped arrangements, probably produced at the same time certain fissures or fractures often nearly vertical, and stretching through the whole mass (Fig. 85). These rents are of great importance to the miner, and may be beneficial to him, or not, according to circumstances. They are called *dykes*, because they divide the seams or bands of coal into *fields*, and are *up-throw* or *down-throw* dykes, according as the edge of the strata appears to an observer to be higher or lower in regard to his own position. They are also called *shifts*, as the miners consider that they have *shifted* the strata on their sides; but the common term is *faults* or *troubles*, from their *troubling* or putting to *fault* the pitmen. A slip dyke of less thickness than the workable seams, and not disturbing their continuity, is called a *hitch*, as at H, Fig. 85. Other dykes, called *whin-dykes*, contain basalt, loadstone, and other rocks of igneous origin. Such dykes may, or may not, be *slip* dykes, or such as cause a shifting of level in the adjacent beds. Thus those at D D, Fig. 85, are not accompanied by any slip. In approaching within a few yards of these once molten streams, the operation of fire is evident in the conversion of loose grits into compact

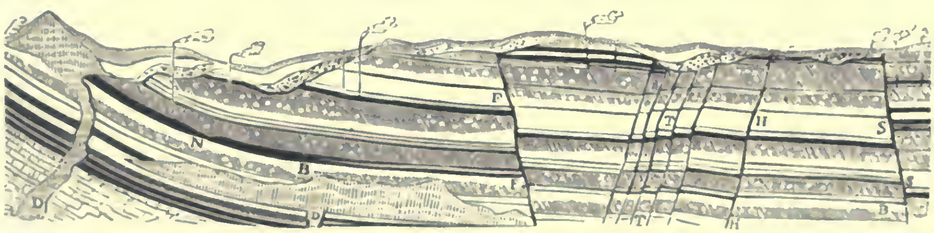


Fig. 85. — Section of the Accidental Features of Coal Fields.

D D, Whin Dykes; F F, S S, Faults or Slip Dykes; T T, Troubles; H, Hitch or Slip. *b* and B B', Bands; N, Nip or Baulk.

sea and land must have gone on uninterruptedly, through a long period of time, not in one district of country only, but all over the world, and during the same geological period. — It will be understood from the preceding details that the series of rocks which constitute the *C.*-measures consists of beds of sandstone, shale, clay, and *C.*, lying one above another in repeated alternations to a great depth. The strata of *C.*, technically called *seams*, are very thin compared with the other associated beds. Although they extend under large tracts of country, they are often only a few inches thick, seldom more than 6 or 8 feet. Under this series is the mountain limestone, forming various calcareous strata of various thickness, sometimes exceeding 900 feet. This limestone rests on a bed of red sandstone, varying in thickness from 200 to 2,000 feet. The various deposits which form the *C.*-measures do not occur in regular horizontal unbroken planes, as might be supposed. There is no doubt that when first deposited they were in this condition, but this horizontal position has at various times been disturbed by some upheaving force from below, whereby the *C.*-measures have, in many districts, been made to assume the shape of a huge trough or *basin*, rising on all sides from a central point, the sides of the basin being composed of quartz, and of clay or shale into slate and porcelain jasper, while the *C.*-seams are diminished in thickness and completely charred, or converted into blind-*C.*, anthracite cinders, sooty ashes, or in some cases coke, as perfect as that obtained from a coke oven. When basaltic or other igneous dykes reach the surface, or what was the surface at the time of their protrusion, their matter is either heaped up so as to form a hill, as in D, to the left of Fig. 85, or spread out into undulating masses, as occurs with the other dyke, D, in the same figure, or sometimes into extensive strata, destroying a vast extent of coal, or converting it into anthracite. It will readily be supposed that dykes are a frequent source of difficulty and expense, by throwing the seams out of their levels and filling the mines with water. Such are the general features of *C.*-measures.

Mineral *C.* is widely distributed over the world. It constitutes the most important of the mineral features of Great Britain, and is one of the principal sources of American wealth. The following account of the compared produce of *C.* in the world in 1870 and 1878 is taken from Mr Fred E. Saward's *The Coal Trade* (Edition 1879)*: —

* We are indebted for most of the statistical information in this article to the editor of *The Coal Trade Journal*. This weekly paper, published in New York, is, we think, in this country, the best acknowledged authority on the subject of coal.

COUNTRIES.	Sq. m. of Coal Area.	Tons — 1870.	Tons — 1878.
Great Britain	11,900	110,431,192	134,610,763
U. States	192,000	32,863,690	49,130,584
Germany	1,770	34,003,004	48,296,367
France	2,086	13,179,708	16,889,201
Belgium	510	13,697,118	13,938,523
Austria	1,800	8,355,944	14,252,038
Russia	30,000	829,745	1,900,000
Spain	3,501	661,927	699,500
Portugal	....	......	20,000
Nova Scotia	18,000	625,769	757,496
Australia	24,840	868,564	1,444,171
India	2,004	500,000	4,000,000
Japan	5,000	......	500,000
Vancouver's Island	390	29,863	190,640
China, Chili, New Zealand, etc	....	3,000,000	4,000,000

This table shows that, notwithstanding its comparatively reduced *C.* area, Great Britain is by far the greatest *C.* producing country in the world. Its *C.* measures are variously disposed in the midland, northern, and western portions of S. England, and in a broad belt of country which traverses the centre of Scotland, from the shores of Ayrshire to those of the Frith of Forth. There are, also, some *C.* tracts of far inferior importance in Ireland. The produce of the 3.738 British collieries actually in operation for the year 1878 was as follows: —

District.	Tons.
North Durham and Northumberland	11,975,250
Cumberland	1,515,783
South Durham	19,235,150
Westmoreland	1,791
Cheshire	645,500
Lancashire, North and East	8,735,055
Lancashire, West	8,886,476
Yorkshire, West Riding	15,952,500
Yorkshire, North Riding	8,150
Derbyshire	6,975,550
Nottinghamshire	3,895,750
Warwickshire	930,850
Leicestershire	1,149,590
Staffordshire, South, and Worcestershire	9,841,191
Staffordshire, North	4,149,975
Shropshire	927,580
Gloucestershire	1,194,726
Somersetshire, Devonshire	666 500
Monmouthshire	4,350.785
NORTH WALES. — Flintshire	855,750
Denbighshire	1,622,590
Anglesey	1,330
SOUTH WALES. — Glamorganshire	11,889,600
Carmarthenshire	526,450
Pembrokeshire	76,400
Brecknockshire	141,885
SCOTLAND, East	11,452.373
SCOTLAND, West	6,867,701
IRELAND	138,722

The *C.* raised in Great Britain, as above stated, was used by the several industries in the following proportions: —

Used for steam-power	23.52	per cent.
Domestic consumption	17.20	"
In the manufacture of pig iron	15.21	"
In the manufacture of merchant iron and steel	15.00	"
Exported	9 27	"
Consumed in and about coal mines	6 25	"
For the manufacture of gas	5.87	"
For steam navigation	3 00	"
Locomotives and engines on railways	1.88	"
Water-works, breweries, etc.	1 35	"
Smelting tin, copper, lead, etc	0.80	"
Consumed in and about metal mines	0.47	"
For use in army department	0.18	"

The exports for 1878 were 19,501,826 tons, of which the U. States took 189,596 tons of bituminous *C.*

Coal Fields and Coal Trade of the U. States. — There are in this country 4 principal *C.* areas, compared with which the richest deposits of other countries are comparatively insignificant. These are the Alleghany, Central, Great Western, and Tertiary *C.* fields.

1. THE ALLEGHANY *C.* FIELD extends from the middle of *A.* to northern Pennsylvania, and contains all the anthracite *C.* beds. The respective areas that this field occupies in the several States which it traverses are as follows: —

	Sq. m.		Sq. m.
Pennsylvania	12,650	Georgia	170
Maryland	470	Alabama	4,500
West Virginia	15,000	Eastern Kentucky	10,000
East Virginia	225	Ohio	7,100
Tennessee	3,700		
		Total area	53,815

Anthracite C. is found in an area of about 500 sq. m., in Luzerne, Carbon, Schuylkill, Northumberland, Dauphin, and Columbia Counties, in the State of Pennsylvania. There are 3 great divisions, which are named from their locations, — the first or Southern, the second or Middle, and the third or Northern *C.* fields. The Southern *C.* field lies principally in Schuylkill County, and hence it is often called the Schuylkill region. The Mahanoy (often included in the Schuylkill) and Lehigh regions constitute the Middle *C.* field. The Northern *C.* field is in Luzerne County, and embraces what is known as the Wyoming, Lackawanna, Scranton, and Wilkesbarre regions. The production is largely controlled by some great carrying and mining corporations, and it is to be regretted that individual enterprises are yearly becoming less in number, in the operations of mining and shipping the product. From the commencement of the industry in 1820, with the shipment to market of 365 tons, it is estimated that the amount marketed is upward of as many million tons. As the area in which this quality of *C.* is found in the U. States is limited, and the absorption of this territory is rapid and wasteful, the question as to the life of our Anthracite *C.* field is of importance. There can be no doubt but that the ability to produce is much less than has been calculated by many persons, — 30,000,000 tons, — and that before many years the Anthracite will be sufficiently appreciated to command a better price than has ruled within a few years past. Many well-informed persons prophesy that, before 10 years shall have passed, Anthracite will be a luxury; the dependence as a source of steam supply will perforce be found in Bituminous *C.*

The following statement gives the comparative details of the Anthracite business for three years, in tons of 2,240 lbs.; but it must be borne in mind that these figures represent the amount carried to market by the several railroads and canals, and not the quantity used and sold at the mines: —

	1878.	1877.	1876.
LEHIGH.			
Lehigh Valley road	2,500,000	3,355,612	2,872,211
Central R.R. of New Jersey.	1,313,000	1,563,992	1,467,937.
Delaware & Hudson Branch of Pa	38,500	35,000	41,736
WYOMING.			
Delaware & Hudson Co	2,137,202	1,999,248	2,006,509
Delaware, Lackawanna & Western R R. Co	2,180,672	2,072,000	2,054,019
Pennsylvania Coal Co	925,991	1,064,583	1,068,475
Central R.R. of New Jersey	950,000	1,393,416	1,422.279
Lehigh Valley R.R.	867,217	905,699	964,100
Pennsylvania & New York R.R	31,500	42,617	26,862
Pennsylvania Canal	347,599	340,231	407 522
SCHUYLKILL.			
Philadelphia & Reading	5,101,044	6,835,244	4,935,401
Shamokin	693,781	766,594	587,274
Williamstown, etc	362,750	315,675	564,342
Totals	17,449,256	20,619,911	18,436,667

The price per ton of Anthracite *C.* sold at auction in 1878, by the controlling companies, and delivered at Hoboken, N. J., was as follows: —

Date of Sale.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Jan. 30	\$3.09	\$3.12½	\$3.15	\$3.57	\$3.10½
Feb. 27	3.11½	3.07½	3.15½	3 55	3.00
Mar. 27	3 25	3.22	3.40	3.69	3.18
May 1	3 30½	3.30	3.45	3 77	3.15
May 29	3 42½	3.45	3.56	3.75	3 25
June 26	3.47½	3.48½	3.58½	3.89	3 25
July 31	....	3.48	3.59	3 90	3.22½
Aug. 28	....	3.52½	3.66½	3.98½	3 37½
Sept. 25	....	3 56	3.68	4.07½	3.52½
Oct. 30	3.46	3 57½	3.67½	4.05	3 32½
Nov. 26	3.20	3.23	3 23¾	3.71¾	3 07½
Dec. 18	2.44	2.55	2.67½	2.98	2.42½

No. Pennsylvania semi-bituminous (or caking) C. Field. The *Blossburg district* sent its first *C.* to market in 1840. The railway from the mines connects with the Erie R.R. at Corning, N. Y., and the N. Y. Central R.R. at Geneva and Lyons. In 1878, the Tioga Transportation Co., the Salt Co. of Onondaga,

the Morris Run *C* Co., the Fall Brook *C.* Co., and the Blossburg *C.* Co., shipped from this district 652,597 tons, against 602,245 in 1877. — The *McIntire C. Co.*, whose mines are at Ralston, on the Northern Central R R., commenced operations in 1870, and shipped 154,205 tons in 1878. The *Barkley district*, located in Bradford County, has its outlet to market via the Sullivan and Erie R.R. The mines now operated are those of the Towanda *C.* Co., and the Schraeder *C* Co. The former shipped 165,035 tons in 1878, and the latter 149,285 tons.

Broad Top semi-bituminous C. Field has an area of about 80 sq. m., the largest seams ranging from 5 to 10 feet in thickness, and the lesser from 1 to 3 From this region, the Huntingdon and Broad Top Mountain R R Co. transported 150,224 tons in 1878, and the East Broad Top R R 63,068 tons.

Snowshoe semi-bituminous C Field is situated in Centre County, Pa , covers an area of about 8 m in length and 4 m. in breadth, and is situated on both sides of Beach Creek. Prof Rogers gives this Snowshoe *C.* 78.8 of fixed carbon, and 21.2 of volatile matter and ashes. The *C.* field finds an outlet to market via the Bellefonte and Snowshoe and Bald Eagle Valley connection of the Pennsylvania R R. The only Co. mining in this district commenced in 1862 with 8,250 tons, reaching 95,257 tons in 1873, and from that time decreasing easily down to 29.168 tons in 1878.

Sonman Region. This district is in Cambria County; the coal is worked in the same vein that is mined in Clearfield county; the *C.* here has a heavier cover than where found in the adjoining county of Clearfield; is strong, and partakes somewhat of the nature of the gas *C.* found in Westmoreland County, which adjoins it on the southwest.

Myersdale district is located in Somerset County, Pa., adjoining the Cumberland region, of Maryland, and the *C.* is stated to be similar to, and an extension of, the Cumberland *C.* basin. The *C.* is of the same quality, and will yield a similar quantity per acre. It is 11 m from Frostburg, Md , and the *C.* finds an outlet to Baltimore and the sea-board markets over the Pittsburgh and Connellsville branch of the Baltimore and Ohio R.R. The Keystone *C.* Co. have been at work here since 1872, and built up a business amounting to 56,273 tons in 1878.

Mercer Co. The most important *C* region in N.W. Pennsylvania, running over into E Ohio, is that of Mercer County. The *C.* produced is what is known as the *splint* or *block C*, and is used in the raw state for smelting iron The principal location of this peculiar *C.* is on the Line of the Erie and Pittsburgh R R. The product finds an outlet to market by this route, and also the Shenango and Alleghany, and the Jamestown and Franklin roads and their connections. The beds vary from 2 to 5 feet in thickness, and some 600,000 tons are annually produced.

Clearfield Region. This *C.* field is located in Clearfield and Centre Counties, in the central portion of Pennsylvania. For an outlet for the products of its mines, it is dependent upon the Tyrone and Clearfield branch of the Pennsylvania R.R , extending from Tyrone on the main line (224 m. west from Philadelphia) to Clearfield, 41 m. The Pennsylvania R R. Co. owns the railroads, the shipping wharves, and all the means of access to the markets of the Atlantic sea-board The advantage of being connected with a railroad of such magnitude, with its wonderful ramifications and connections, gives the *C.* proprietors of this region great facilities for the proper conduct of their business; and it is owing to the very liberal policy of this corporation that the district has been enabled to take the rank which it has assumed, in connection with the fuel supply of the sea-board. The geological report classes the Clearfield *C.* as truly bituminous. The production has been steadily increasing from 169,219 tons in 1867 to 639,630 tons in 1874, and 1,295,201 tons in 1878.

Monongahela Region. By means of its slack-water navigation, the Monongahela River is made navigable at all seasons of the year, and boats carrying 800 tons are passed down. The city of Pittsburgh is supplied mainly by railroad, and the larger portion of the *C*, by river, is run down the Ohio and Mississippi to the lower markets. In this connection, the cost of transporting *C* over waterways, as from Pittsburgh to New Orleans, is of value. The distance is something like 2000 m.; the rate is about 3½ cents per bu , or $1 05 per ton of 2,240 lbs , the ordinary time being about two weeks, when all circumstances are favorable. From Pittsburgh to Louisville, Ky , the distance is 600 m.; the cost, 1½ cents per bu., including return of empty craft, and the time 5 days In 1878, the shipments by the slack-water transportation were 2,797,630 tons, while the Penn R.R. carried 1,429,428 tons from this district.

Westmoreland Region. The celebrated Penn and Westmoreland Gas Co. is mined near Penn and Irwin stations, on the Penn. R.R., in Westmoreland County. the distance from Philadelphia is 332 m. The *C* mined is the great Pittsburgh bed of bituminous *C.*; the companies operating in this region are large and influential, among them being the Penn Gas *C.* Co., and the Westmoreland Gas *C.* Co The *C.* is used in every sea-board city for gas purposes, and always commands the highest price; in fact, it makes the rate for all other gas-producing *C.* that reaches the sea-board. The shipping points are South Amboy, N J , and Greenwich (on the Delaware River), below Philadelphia Shipments in 1878 were 692,586 tons.

Connellsville Coke Region. See Coke.

West Virginia Gas C. This class of gas *C.* is mined in Marion, Taylor, Ritchie, and Preston Counties, W. Virginia, the mines being located near to or upon the main line of the Baltimore and Ohio R R. The trade to the sea board, which amounted to 259,158 tons in 1869, has gradually fallen down to 103,165 tons in 1877 The cause of this considerable diminution is the cheaper gas *C* furnished from Great Britain, due to the low water rates The introduction of *C.* from the Kanawha district, and the discriminating policy of the Baltimore and Ohio R R., have also affected this region.

The Cumberland Region The Cumberland (George's Creek) *C.* field, located in Alleghany County, at the W. extremity of the State of Maryland, supplies an important portion of the semi-bituminous *C* reaching the sea board markets The connections with the tide-water markets are: — via the Baltimore and Ohio R.R., from the town of Cumberland, 178 m., and Piedmont, 206 m., W. from Baltimore The Chesapeake and Ohio Canal, following the Potomac River to Georgetown, 184 m., and Alexandria, 191 m. from Cumberland The boats carry 110 tons, and make the trip in 4 to 5 days Steam canal boats have been introduced on this water-way with considerable success, in point of time and economy of movement. The canal is owned by the State, and is managed by a Board of Public Works. The mines of the George's Creek *C* field are located near to, or upon the line of the Cumberland and Penn. branch road, extending through the region, say 2 to 20 m from Piedmont, and from 11 to 33 m. from Cumberland. The mines are, with 1 exception (the Borden shaft), drift openings in the hillside, the *C.* being let down inclined planes ranging from 300 to 2,000 feet in length to the main railroad, which follows the descent of the stream towards Piedmont The product of these mines is of superior quality, and has stood the test for 35 years The seam of coal worked is known to be 14 feet in thickness; its full extent is seldom taken out, however, from various causes. Labor in this region has always been well remunerated, and there was no reduction in the price of mining the *C.* from 1866 up to 1877, while on the other hand, the price of *C.* at the shipping points fell off about one half within that period of time. The following statement shows the products of each Co. operating in this region for the years 1877 and 1878: —

Companies.	Tons in 1878.	Tons in 1877.
Consolidation	404,015	348,385
New Central	352,848	346,038
George's Creek Coal and Iron Co	87,910	121,553
Atlantic and George's Creek	79,778	96,211
Borden	121,383	97,907
American	105,538	117,434
Hampshire and Baltimore	119,476	91,516
Maryland	120,311	120,543
Swanton	37,620	49,086
Franklin	134,481	45,220
George's Creek Mining	......	1,725
Potomac	66,256	63,659
Blaen Avon	28,304	33,769
Piedmont	27,189	35,796
North Branch	620	......
New Reading	......	......
George's Creek Valley	56	1,125
Canton	......	1,212
Union Mining Co.	3,637	3,220
Total	1,679,322	1,574,339

The Kanawha Region (W. Va.). The *C.* measures of W Virginia underlie nearly 16,000 sq m of territory, of which, what are known as the Kanawha and New River Valley, traversed by the Chesapeake & Ohio R.R , hold 8,000 Several varieties of *C.* occur, among which are: — Cannel, Splint, Gas, and Bituminous. The Bituminous *C* is an excellent steam-raising fuel, and has been used on steamers, railways, and under stationary engines, with good results. The Gas *C.* seam is productive of a most excellent quality, that has been used in both the Eastern and Western markets with most satisfactory results.

2. The Central *C.* Field extends through Indiana, Illinois, and Kentucky, embracing an area of 40,400 sq. m., of which 6,700 are in Indiana, 30,000 in Illinois, and 3,700 in W Kentucky. This *C* field is only second in importance to the vast area already described The *C.* is generally bituminous *C* of excellent quality for many purposes; one kind burning with much light and very freely, approaching Cannel *C* in most of its properties; other kinds consist of caking *C*, splint *C*, and satin-black block *C*, equal to the best in Pennsylvania. Much larger portions of the *C* lie below the water-level in the central field, and most of the mining is done by shafting, and is at present almost exclusively confined to the margins of the field. This is owing principally to the fact that the lower barren measures cover and conceal the beds to a great depth in its more central portions. A circle of pits and mines almost surrounds this field Commencing at Iron City on the Ohio, in the Indiana block *C.* district, it extends almost directly N. to Brazil, from thence curves N. W. to Danville or Milford, Gilman, and La Salle in Illinois, and from thence W to Rock

Island; thence down the Mississippi, in an irregular line, some distance E. of the river to Alton and Bellville, thence to the Mt. Carbon mines on the Big Muddy, Duquoin on the Illinois Central R.R., and Shawneetown on the Ohio, below Evansville. Here the bed crosses the river into Kentucky, and, making a half-circle in that State, again crosses the river to the point of starting at Iron City. The *C.* is mined in many localities around this entire circle. About 2,000 miners were at work in the block *C.* districts, producing more than 8,000 tons of *C.* a day. Much of this *C.* is used in the blast furnaces which have recently been erected near Brazil; and large shipments are made to Chicago, St. Louis, and many of the surrounding towns and cities. Both at La Salle and Rock Island extensive mining operations are conducted; while opposite St. Louis, and at Mt. Carbon, the *C.* mines are still more productive. The total production of this field in 1878 was about 5,400,000 tons.

3. THE GREAT WESTERN *C.* FIELD, though but little developed, is the largest *C.* field in the world. Its area, as stated by the learned author of the art. *Coal* in the *Am. Cyclopædia*, is no less than 357,000 sq. m. A very limited portion, however, of this great *C.* field is exposed, perhaps not over 130,000 sq. m., and still less have been explored in Nebraska, Kansas, Iowa, Missouri, Arkansas, and the Indian Territory, while much the larger area is covered and concealed by the overlying formations, from 3,000 to 5,000 feet of which are piled on the *C.* measures.

4. THE TERTIARY *C.* FIELDS of the U. States are scarcely less extensive than the western field. Fully 50,000 sq. m. of this formation have been identified and partially developed, while it is estimated that no less than 250,000 sq. m. exist in the U. States and the British possessions. They include a large area within the Western *C.* field in Kansas, Colorado, and Dakota, but a much larger one is found outside of its limits in Wyoming, Montana, and Saskatchewan (British America), while numerous detached basins or fields are found in Colorado, New Mexico, Texas, California, Oregon, and Washington. It is not yet possible to designate all the localities of the tertiary *C.* in the U. States; but as far as present developments indicate, the great regions of these tertiary formations are parallel with the Rocky Mountain ranges. Immense beds are found along the Union Pacific R.R. in Wyoming Territory, and from Cheyenne, on this road, along the E. base of the mountains, through Colorado, New Mexico, and Texas, while they extend eastward into Kansas. The present most productive mines are at Carbon, Rock Springs, and Almy stations (Evanston mines), on the Union Pacific R.R., and at Boulder City, Central City, and Canon City, Colorado; and this formation is supposed to exist both E. and W. of the Black Hills of Wyoming, and those of Dakota (which are distinct mountains E. of the Rocky Mountains), extending in parallel ranges into Dakota on the E. and Montana on the W. of these mountains, and continuing into the British possessions. The more western tertiary exist along the coast ranges in California, Oregon, and Washington. The prominent localities where *C.* is now mined are at Bellingham, Washington Territory, Vancouver's Island, Coös Bay in Oregon, on the Columbia River, and near San Francisco at Mt. Diablo. There are many other localities in California, Oregon, and Washington where small deposits are found; in many cases these constitute only part of the more extensive formations which cannot yet be distinctly defined.

The following table shows the tonnage of the *C.* trade of the U. States for the year 1869, as per census reports made in 1870, together with figures for the year 1878, taken from reports of the trade in the various States: —

	1869 — Tons.	1878 — Tons.
Pennsylvania Anthracite	13,866,180	17,605,262
Pennsylvania Bituminous	7,798,517	13,500,000
Illinois	2,629,563	3,500,000
Ohio	2,527,285	5,000,000
Maryland	1,819,824	1,679,322
Missouri	621,930	900,000
West Virginia	608,878	1,000,000
Indiana	437,870	1,000,000
Iowa	263,487	1,500,000
Kentucky	150,582	900,000
Tennessee	133,418	375,000
Virginia	61,803	75,000
Kansas	32,938	300,000
Oregon	......	200,000
Michigan	21,150	30,000
California	......	600,000
Rhode Island	14,000	14,000
Alabama	11,000	200,000
Nebraska	1,425	75,000
Wyoming	50,000	100,000
Washington	17,844	150,000
Utah	5,800	60,000
Colorado	4,500	367,000
Total	31,116,595	49,130,584

Table of yearly prices for Schuylkill White Ash Lump C., on board vessels at Philadelphia, for 20 consecutive years: —

Years.	Prices.	Years.	Prices.
1859	$3 25	1869	5.31
1860	3.40	1870	4.39
1861	3.39	1871	4.46
1862	4.14	1872	3.74
1863	6.06	1873	4.27
1864	*8.30	1874	4.55
1865	7.86	1875	4.39
1866	5.80	1876	3.87
1867	4.37	1877	†2.59
1868	3.86	1878	3.25

* Lowest average for year. † Highest average for year.

Table of the Imports and Exports of C. to and from the U. States for the years 1870 *to* 1878: —

Year.	Imports. Tons.	Exports. Tons.
1870	420,688	227,918
1871	443,955	277,951
1872	490,631	401,078
1873	456,015	584,633
1874	498,028	763,402
1875	441,600	519,345
1876	407,853	568,076
1877	497,260	740,456
1878	578,457	660,138

The imports were from Australia and British Columbia to San Francisco; from Great Britain to the Atlantic and Pacific ports; and from Nova Scotia to Atlantic coast ports. The exports were mostly to the Dominion of Canada and Cuba.

Imp. duty. The tariff from 1824 to 1843 was 6 cts. per bu., or $1.68 per ton; from 1843 to 1846, $1.75 per ton. 1846, 30 per cent ad valorem; 1847 to 1861, 24 per cent ad valorem; 1862-3-4, $1.00 per ton; 1865, $1.10; 1866 to 1872, $1.25 per ton: since August, 1872, 75 cts. per ton.

Coal-Barge, a flat-bottomed river-boat for transporting coal short distances to wharves, etc.

Coal-Box, a scuttle to hold coals in a room.

Coal-Breaker is a machine for crushing lump-coal as it comes from the mine. The breaker erected near Hyde Park by the Delaware, Lackawanna, and Western R.R. Co., cost about $250,000, and the Erie R.R. Co. has one near Carbondale which cost $300,000. These powerful and complicated machines are of various forms, but they are all built on the principle of rollers with spikes, as shown in Fig. 86.

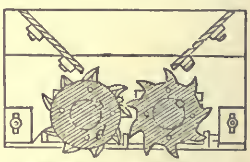


Fig. 86. — COAL-BREAKER.

Coal-Bunker, a closed room around the boiler and engine-room of a steam-vessel for keeping the fuel.

Coal-Drop, Coal-Dumping Apparatus, a staith or contrivance for shooting or lowering coals into the hold of a vessel.

Coal-Dust, the small broken or fine coal, after the large masses have been screened.

Coal-Fish, a name of the British coasts for the pollock.

Coal-Gas, the common illuminating gas made from coal. See GAS MANUFACTURE.

Coal-Heaver, a porter who loads and unloads coal wagons.

Coal-Hulk, a vessel kept as a receptacle for coal, usually on some foreign station, to supply steamers.

Coal Oils, a general name for mineral oils.

Coal-Pit, the mouth of a coal-mine, or the descent to a colliery. — Also a place where charcoal is made.

Coal-Scoop, a shovel for taking coals from a scuttle to throw on fire.

Coal-Scuttle, a portable metal receptacle for coals in a room.

Coal-Shed, a retailer's depository for coals.

Coal-Shoot, a metal scuttle or vase for holding coal.

Coal-Shovel, a small shovel for filling a coal-scuttle from the cellar; a larger kind is used by coal-heavers.

Coal-Staith, a drop or machine on an elevated wharf for shipping coal.

Coal-Tar, one of the products of the destructive distillation of the coal employed in the manufacture of gas, is a very complex substance, consisting of various hydrocarbons, acids, and bases, together with certain resinoid and empyreumatic substances. The quantity as well as the quality of the tar obtained from the distillation of coal varies considerably with the kind of coal used, as well as with the temperature at which the distillation is carried on, the yield of tar being smaller at very high temperatures than when lower ones are employed. *C.-T.*, from its antiseptic properties (due chiefly to the carbolic acid it contains), is painted on wood to preserve the latter from decay when exposed to wind and weather. It furnishes the chief ingredient of printers' ink in the shape of lampblack. Mixed with coal-dust, saw-dust, and peat-dust, it forms a useful artificial fuel, and when incorporated with pebbles makes an excellent artificial asphalt for pavements. The chief value of *C.-T.*, however, consists in its being the source of those brilliant dye-stuffs, the aniline colors. These, together with the naphtha obtained from its distillation, have converted coal-tar from a worthless and unwelcome waste product of gas manufacture — for the removal of which from their premises the gas makers were formerly only too glad to pay — into a very considerable and important branch of manufacture. The different constituents of the tar are separated from each other by distillation, the various products so obtained being further purified by various processes. See ANILINE COLORS, BENZOLE, NAPHTHA, etc.

Coal-Wharf, a landing pier where coals are deposited.

Coal-Whipper, a London porter who unloads coals from ships at the wharves, etc.

Coamings, raised borders of wood round the edges of hatches and scuttles of a ship, to prevent water flowing down from the deck, and to receive and support the hatches, etc.

Coaster, a vessel employed in the trade along shore, and which does not sail far from land.

Coasting-Trade, the trade or intercourse carried on by sea between two or more ports or places of the same country. In England, foreigners were formerly excluded from all participation in the *C.-T.*, but by Act of 1855 (17 Vict. c. 5) the *C.-T.* has been made quite free. In the U. States, that trade has been, and is still, strictly reserved for vessels built within our territory and owned by our citizens, to the exclusion of foreign-built and foreign-owned vessels. The Regulations concerning the *C.-T.*, and Enrolment and License of vessels employed in that trade and also in our rivers and lakes, are embodied, under the title L, sect. 4390 of the Revised Statutes, entitled, *Regulation of Vessels in Domestic Commerce*, and are as follows, viz.: —

Vessels of 20 tons and upward, enrolled, and having a license in force, and vessels of less than 20 tons, not enrolled, but having a license in force, and no others, shall be deemed vessels of the U. States, entitled to the privileges of vessels employed in the coasting-trade and fisheries. Every vessel of 20 tons or upward (other than such as are registered) trading between district and district, or between different places in the same district, or carrying on the fishery, without being enrolled and licensed, or if of less than 20 tons, and not less than 5 tons, without a license, if laden with goods the growth or manufacture of the United States only (distilled spirits only excepted), shall pay the same fees and tonnage in every port at which she may arrive as are payable by vessels not belonging to a citizen of the U. States, and if she have on board any articles of foreign growth or manufacture, or distilled spirits, other than sea-stores, she, together with her tackle, apparel, and furniture, and lading, found on board, shall be forfeited. But if such vessel be at sea at the expiration of the time for which the license was given, and the master shall swear that such was the case, and shall also, within forty-eight hours after his arrival, deliver to the collector of the district in which he shall first arrive the license which shall have expired, she shall not be forfeited, nor shall be liable to pay such fees and tonnage. No goods shall be imported, under forfeiture thereof, from one to another port of the U. States, in a vessel belonging wholly, or in part, to a subject of any foreign power; but such vessel may sail from one to another such ports, carrying such goods only as were imported in her from some foreign port, and which shall not have been unladen.

Enrolment and License of Vessels. The like qualifications and requisites are necessary for the enrolment as for the registry and record of vessels, and the same duties are imposed on, and authority given to, all officers respectively, in relation to such enrolments, and the same proceedings shall be had in similar cases touching such enrolments; and vessels so enrolled, with their masters or owners, shall be subject to the same requisites as are in these respects provided for registered vessels. The record of such enrolment shall be made, and an abstract or copy thereof granted, as nearly as may be, in the form directed by law. Enrolled and licensed vessels may be registered upon the registry being given up; and registered vessels may be enrolled, upon surrendering up the enrolment and license. And when any vessel shall be in any other district than that to which she belongs, the collector, on application of the master, and on his making oath that, to the best of his knowledge and belief, the property remains as expressed in the register or enrolment, proposed to be given up, and upon his giving the bonds required for granting register, shall make such exchanges, and such collector shall transmit the register or enrolment given up to the register of the treasury. The register or enrolment and license granted in lieu thereof, shall, within ten days after the arrival of the vessel within the district to which she belongs, be delivered up to the collector of such district, and be by him cancelled. And if the master shall neglect to deliver such register or enrolment and license within the time specified, he shall forfeit one hundred dollars. In order to the licensing of any vessel for carrying on the coasting-trade or fisheries, the husband, together with the master, with one or more sureties, to the satisfaction of the collector, shall become bound to pay to the U. States, if she be of the burden of 5 tons and less than 20 tons, the sum of $100; and if of 20 tons, and not exceeding 30 tons, the sum of $200; and if above 30 tons, and not exceeding 60 tons, the sum of $500; and if above 60 tons, the sum of $1,000, in case it shall appear, within two years from the date of the bond, that she has been employed in any trade whereby the revenue of the U. States has been defrauded, during the time her license remained in force; and the master of such vessel shall also swear that he is a citizen of the U. States, and that such license shall not be used for any other vessel, or any other employment than that for which it is specially granted, or in any trade whereby the revenue may be defrauded; and if such vessel be less than twenty tons burden, her husband shall swear that she is wholly the property of a citizen or citizens of the U. States, whereupon the collector of the district whereto such vessel may belong (the duty of 6 cents per ton being first paid) shall grant a license, in the form directed by law, for carrying on the coasting-trade, whale fishery, cod fishery, or mackerel fishery. A steam-vessel, intended to be employed only in a river or bay of the U. States, owned wholly or in part by an *alien*, resident within the U. States, shall be enrolled and licensed as if she belonged to a citizen of the U. States except that no oath shall be required that she belongs to a citizen or citizens of the U. States. The owner of such steam-vessel, upon application for enrolment or license, shall give bond to the collector of the district, to and for the use of the U. States, in the penalty of $1,000, with sufficient surety, conditioned that she shall not be employed in other waters than the rivers and bays of the U. States. When the master of any licensed vessel, ferry-boats excepted, shall be changed, the new master, or, in case of his absence, an owner, shall report such change to the collector residing at the port where the same may happen, if there be one, otherwise to the collector residing at any port where such vessel may next arrive, who, upon the oath of such new master, or, in case of his absence, of an owner, that he is a citizen of the U. States, and that she shall not, while such license continues in force, be employed in any manner whereby the revenue may be defrauded, shall indorse such change on the license, with the name of the new master, and when any change shall so happen, and shall not be reported, and the indorsement so made, such vessel, found carrying on the coasting-trade or fisheries, shall be subject to pay the same

fees and tonnage as a vessel of the U. States having a register, and the new master shall forfeit and pay the sum of ten dollars. Before any vessel, of the burden of 5 tons, and less than 20 tons, shall be licensed, the same admeasurement shall be made, and the same provisions observed relative thereto, as are to be observed in case of admeasuring vessels to be registered; but in all cases where such vessel, or any other licensed vessel, shall have been once admeasured, it shall not be necessary to measure her anew for the purpose of obtaining another enrolment or license, except she shall have undergone some alteration as to her burden subsequent to the time of her former license. Every licensed vessel shall have her name, and the port to which she belongs, painted on her stern, as is directed for registered vessels, and if found without such painting, the owner shall pay $20. See MERCHANT MARINE.

Tonnage of the U. States merchant marine employed in the Coasting-Trade, from 1859 *to* 1878 (*not including the Cod and Whale fisheries*).

Year.	Enrolled vessels.	Licensed vessels, under 20 tons.	Total.
	Tons.	Tons.	Tons.
1859	2,439,320	41,609	2,480,929
1860	2,599,319	45,548	2,644,867
1861	2,657,293	47,251	2,704,544
1862	2,568,546	38,170	2,606,716
1863	2,918,614	42,019	2,960,633
1864	3,204,227	41,038	3,245,265
1865	3,353,657	27,865	3,381,522
1866	2,689,152	30,469	2,719,621
1867	2,627,151	33,239	2,660,390
1868	2,658,404	43,736	2,702,140
1869	2,470,928	44,587	2,515,515
1870	2,595,328	42,919	2,638,247
1871	2,722,372	42,228	2,764,600
1872	2,883,906	45,646	2,929,552
1873	3,116,373	46,847	3,163,220
1874	3,243,656	49,783	3,293,439
1875	3,169,687	50,011	3,219,698
1876	2,547,490	51,345	2,598,835
1877	2,488,189	52,133	2,540,322
1878	2,444,801	52,369	2,497,170

Coat, a covering of paint, varnish, or other material given to any substance; an outer garment for men.

Coatee, a short cut-away body coat.

Coat-Link, a pair of buttons or studs joined by a link to close a coat with buttonholes.

Cob, in Cornwall, England, the process of crushing ore with hammers to separate the worthless parts. — The hard stalk from which the grain of Indian corn has been removed. When chopped it is given as provender to live-stock. — A hazel-nut. — A wicker basket for the arm. — A name given in some places to the hard dollar. — In England, a strong stiff-built pony used for carrying heavy persons in the saddle.

Cobalt, a mineral of a gray color, with a shade of red, and by no means brilliant. It has scarcely any taste or smell; is rather soft; specific gravity about 8.6. Sometimes it is composed of plates, sometimes of grains, and sometimes of small fibres adhering to each other. The oxide of cobalt is extensively used as a means of dyeing glass, and for glazing and coloring porcelain. The principal ores of cobalt are the arseniates, called *arsenical C.* and *gray C.* They are found in Sweden, Saxony, Saalfeld, Hessia, and in England in Cumberland and Cornwall. A very small amount of oxide is sufficient to tinge a large quantity of glass. See SMALT.

Cobalt Bloom, the red arseniate of cobalt; a beautiful mineral found with the ores of cobalt, and used in the manufacture of smalt.

Cobang, a gold coin of Japan worth about $6.50.

Cobbing, a mining name for old furnace bottoms, pieces of brick, etc., thrown into a smelting furnace.

Cobble, a large, heavy pebble, or fragment of stone, used in paving streets.

Cobbler, a jobbing shoemaker, one who undertakes repairs. — A cooling drink, a mixture of wine, sugar, lemon, and ice.

Cobbler's Wax, a shoemaker's composition of resin and wax, for stiffening his thread.

Cob-Crushing Machine, a mill for breaking the cobs of Indian-corn for cattle-food. See CORN MILL.

Cobija. See BOLIVIA.

Cob-Iron, an andiron with knobs.

Coble, the name of a kind of pilot and fishing boat used on the northern sea-coasts, having a low square stern and little or no keel on the after body.

Cob-Nut, an improved variety of the common hazel-nut, of which there are several kinds cultivated.

Cobourg, a thin worsted fabric, a lady's dress material composed either of wool and cotton, or of wool and silk.

Cobre, a name for the covid in China of 14.625 inches.

Cobres, a European name for the finest quality of indigo made in Central America.

Coca, the leaves of *Erythroxylon coca*, a plant which is grown largely in Peru and Bolivia. The Bolivian *C.* is said to be much superior to the Peruvian. The best kind is believed to come from the prov. of Yungas, and the most inferior description from Peru. The consumption of *C.* in Peru, Bolivia, and in some of the prov. of the Argentine Confederation is enormous. In small doses it is supposed to act as a stimulant and to aid digestion; in large ones it is said to possess dangerous narcotic properties. The mountaineers in S. America state they are enabled to reach high elevations without difficulty of respiration, and to stave off the feeling of hunger by chewing the leaves during their ascents. Good quality *C.* should have its leaves unbroken, of a medium size, bright green color, and of an odor somewhat combining that of hay and chocolate. The taste is bitter, and when masticated, *C.* is said to yield easily to the teeth. Infused in hot water, it has a beautiful green color, which, however, is much darker from inferior leaves. An infinite number of varieties are recognized between the best and the lowest quantity, which has a disagreeable smell and color resembling roasted coffee. The leaves are also bent and broken, scarcely a whole leaf being found amongst them. *Imp.* free.

Cocculus Indicus, Indian Berry [Fr. *cocque du Levant;* Ger. *Kokkels Körner;* It. *galla di Levante;* Malay, *tubabidgi;* Sans. *kakamari*], the fruit or berry of the *Menispermum cocculus*, a stray climbing tree found on the Malabar coast, in Ceylon, etc. The berry is kidney-shaped, dark brown, about the size of a large pea; but when dried and imported it is shrivelled and smaller. The outer layer encloses a woody shell, containing a yellowish kernel. *C. I.* is acrid and intensely bitter. In some parts of the East it is used, when formed into a paste with moistened rice, as a bait by fishermen and bird-catchers, but especially the former. Being thrown into the sea, or scattered on the ground, it is greedily devoured by the fish and birds, which it either kills or stupefies, so that they are easily captured. It is said not to render the flesh of such animals poisonous, as strychnine does Its effects on man have not been accurately determined, but if taken in large doses it would, no doubt, be fatal. When added to malt liquors it increases their intoxicating power; and provided it be not administered in excess, or does not exceed 3 lbs. *C.* to 10

qrs. malt, its use in this way is not supposed to have any injurious influence.

Cochenilla Wood, the heart of a tree shipped from St. Domingo, furnishing a handsome furniture wood.

Cochi, a grain measure of Siam of 6¼ lbs.

Cochineal [Dutch, *conchenilje;* Fr. *cochenille;* Ger. *Koschenilje;* It. *cocciniglia;* Port. *cochenilha;* Sp. *cochenilla, grana*], the dried carcasses of the female *Coccus cacti*, found in Mexico, Central America, Brazil, the Canary Islands, etc. Formerly it was in Mexico only that it was raised with care, and formed a valuable article of commerce; but its culture is now more or less attended to in many other places, and especially in the Canary Islands. It is a small insect, seldom exceeding the size of a grain of barley, which feeds on the leaves of several species of *cacti* of the genus *opuntia;* and was generally believed, for a considerable time after it began to be imported into Europe, to be a sort of

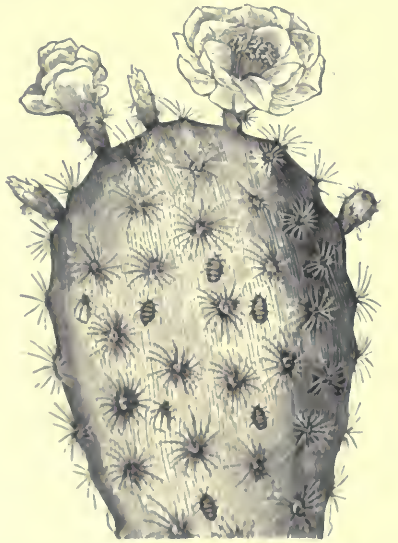


Fig. 87. — Cactus Cochinillifer.

vegetable grain or seed. There are two sorts or varieties of *C.*: the best or domesticated, which the Spaniards call *grana fina*, or fine grain; and the wild, which they call *grana sylvestra*. The former is nearly twice as large as the latter, probably because its size has been improved by the favorable effects of human care, and of a more copious and suitable nourishment, derived solely from the *Cactus cochinillifer* (Fig. 87), during many generations. Wild *C.* is collected six times in the year; but that which is cultivated is only collected thrice during the same period. The insects, of which there are about 70,000 in a pound, being detached from the plants on which they feed by a blunt knife, are put into bags, and dipped into boiling water to kill them, after which they are dried in the sun. It is principally used in the dyeing of scarlet, crimson, and other esteemed colors. The watery infusion is of a violet crimson; the alcoholic, of a deep crimson; and the alkaline, of a deep purple, or rather violet hue. It is imported in bags, each containing about 200 lbs.; and has the appearance of small, dry, shrivelled, rugose berries or seeds, of a deep brown, purple, or mulberry color, with a white matter between the wrinkles. In this state they suffer no change from length of keeping. The best *C.* is that which is large, plump, dry, and of a *silver-white* color on the surface. The species of *C.* called *granilla*, or dust, is supposed to be principally formed of *grana sylvestra* The insects of which it consists are smaller than those composing the fine cochineal; and it does not yield more than a third part of the coloring matter that is yielded by the latter. About 500 tons of *C.* are annually imported into the U. States, chiefly from Mexico and Honduras, while England imports about 1,500 tons. Its market value in New York is about 75 cts per lb. *Imp.* duty, *C.*, free; *C.* lake, 25 per cent.

Cochin China, the eastern part of the Indo-Chinese peninsula, composed of the territories of Anam proper, Tong-king, and the French colony of *C. C.* It forms a long strip of country which stretches in an arc of a circle along a coast line of 1,240 m. from lat. 8° 30′ to 23° N. With a breadth of 372 m. in the north of Tong-king, it is afterwards narrowed by a chain of mountains parallel to the China Sea, and has no more than 50 m. of breadth in the greater part of the kingdom of Hué; but in lower *C. C.* it widens out again to about 190 m. The boundaries are, — N. the Chinese prov. of Yun-nan and Kwang-Si, E. and S. the China Sea, W. the Gulf of Siam, the kingdom of Cambodia, and the Laos county tributary to the Siamese empire. The empire of Anam has an area of from 190,000 to 230,000 sq. m.; while the French colony occupies about 21,630. Passing along the coast from Cape Pak-loung, where the frontier commences between China and Tong-king, we find the mouth of the river Hong-kiang (Red River), which leads to Ke-cho, or Ha-nor, the chief town of Tong-king. This town and the port of *Ninh-hai*, in the prov. of Hai-Dzuong, were opened to foreign commerce by a treaty concluded between France and the government of Hué, March 15, 1874. To allow a ship to pass up the river at any season, its draught must not exceed 5½ feet, and from the end of May to the end of Nov. vessels drawing 12 feet can cross the bar. At Cape Boung-qui-hoa there is a good anchorage well sheltered by islands. In front of Cape Lay is the little Tiger Island, where the W. coast of the gulf of Tong-king terminates. On the China Sea, the coast presents successively, as we pass southward, the mouth of the river Hué, defended by a port; the Bay of Tourane, wide, deep, and well sheltered; the Bay of Quit-quit, a very good anchorage, and the safest on this coast during the N.E. monsoon; the port of *Qui-nhon*, or Binh-dhinh, opened to European commerce by the treaty of March, 1874; the bay and the commodious port of Thu-yen; the port of Hon-ro, to the S. of Cape Varela, which is safe at all seasons of the year; and Cape Ba-kee, which forms the limit between lower *C. C.* and the kingdom of Anam. The whole of lower *C. C.* being formed of alluvial deposits, its coast is very low, has little irregularity of surface, and is covered with mangroves. The different mouths of the River Cambodia, or Me-kong, form a delta of more than 70 m in extent. At the entrance of the river Don-nai, which leads to *Saigon*, rises Cape St. Jacques, a peak 920 feet above the level of the sea. At 45 sea-miles from the coast and from the mouths of the Cambodia, is the island of Pulo Condore, with a good port and a penitentiary established by the French government. On the W. coast of *C. C.*, in the Gulf of Siam, is the port of Ha Tien, communicating by a canal with one of the arms of the Cambodia. The climate of the N. of Anam

differs much from that of the S. In Tong-king the thermometer falls to 41° to 43° in Dec. and Jan., while the summer is excessively hot; but on the whole it is a healthy country. The mean temperature of lower *C. C.* is 83° F. The greatest heat in April and May within doors is 97°. In the mornings of Dec. the temperature falls to 65°. The climate is very unhealthy for Europeans, owing to the character of the soil, which consists of recent alluvial deposits, is absolutely flat, and in some places below the level of the sea. The forests furnish several kinds of timber for building. In the plains and valleys are numerous fruit-trees, — the banana, the guava, the papaw, the medlar-tree, the orange, the citron, and, most abundant of all, the cabbage-palm and the cocoa-tree, and the cinnamon, of which Tong-king furnishes a superior quality. The people of Anam is essentially agricultural. Besides rice, which is the chief production of the country, the cultivated lands furnish cotton, mulberry, sugar-cane, Indian corn, betel-nuts, and vegetables, especially potatoes, earth-nuts, and pepper. Tea is cultivated also, but the people of Anam do not know how to prepare it. There is little industrial activity in Anam, but in Tong-king the manuf. of articles inlaid with mother-of-pearl is carried on. From China *C. C.* received a large quantity of manufactured goods, cotton and silk stuffs, porcelain, and tea. The importation from France is also very considerable. The principal exports are rice (which forms of itself half the sum total) salt-fish, salt, undyed cotton, pepper, and the skins of animals. The great commercial importance of *C. C.* arises from the excellence of its situation, as a way of communication with the rich and populous provinces of middle China. It is difficult to state the exact number of the population of the empire of Anam, and authors vary greatly in their estimates. The data which appear the most worthy of credit give a total sum of 10 or 12 millions. As to the French colony, the last official census gives 1,487,200 inhabitants, of whom 49,500 were Chinese, and 82,700 Cambodians. The Europeans numbered 1,114, exclusive of the government officials and the garrison. Hué or Plu-tua-tien, capital of the kingdom of Anam, contains about 100,000 inhabitants. The two principal ports of French *C. C.* are *Saigon*, capital of the colony, and Mì-thô, on one of the arms of river Cambodia.

Cochorn, a small brass mortar, usually about 5½ inches bore, but sometimes rather smaller.

Cock, to lift the hammer of the lock of a pistol or musket, etc. See Cocks.

Cock-Bill, a nautical term applied to an anchor, projecting, or hanging perpendicular by the stopper, from the cat-head.

Cock-Boat, a very small boat.

Cocket, in England a warrant from the Custom House, on entering goods, showing that the duty on them has been paid.

Cock-Founder, a caster in brass, one who makes metal spigots.

Cockle, an edible mollusk, the *Cardium edule*, extensively found in the sands of the sea-shore.

Cocks, Stop-Cocks, metal taps or escapes for gas and fluids, some of which are turned on and off by the hand; others, acted upon by a floating or air ball, are self-regulating.

Cockspurs, small clay wedges used in the potteries to separate articles of pottery ware, after the process of glazing, and to prevent them adhering.

Cockswain, Coxwain, the steersman of a boat.

Cocoa. See Cacao.

Cocoa Fibre. See Cocoa-Nut and Coir.

Cocoa-Mats. See Coir.

Cocoa-Nut, or **Coco** [Fr. and Sp., *coco; Ger. Kokonüss;* It. *coccho*], the well-known edible fruit of the *Cocos nucifera* palm, (Fig. 88), many thousands of which are imported into this country from the West Indies and South America, as dunnage in ships, and sold in the streets and fruit-stands. The *C. N.* tree, common everywhere within the tropics, is extremely valuable, every part of it being appropriated to some useful purpose. It grows to the height of from 50 to 90 feet; it has no branches, but the leaves are from 12 to 14 feet in length, with a very strong middle rib. The fruit is nearly as large as a man's head; the external rind is thin, tough, and of a brownish red color. Beneath this, there is a quantity of very

Fig. 88. — Cocoa-Nut Trees.

tough fibrous matter, which is used in the manufacture of cordage and coarse sail-cloth. It is buoyant, and extremely well suited for ropes of large diameter; and until the introduction of chain cables most of the ships which navigated the tropical seas were supplied with cables of this material. (See Coir.) Within the fibrous coating is the shell of the nut, which is nearly globular, very hard, susceptible of a high polish, and used for many domestic purposes; the kernel is white, in taste and firmness resembling that of a hazelnut; it is hollow in the interior, the hollow being filled with a milky fluid. While the nut is green, the whole hollow of the shell is filled with fluid, which is refreshing, agreeable, and pleasant to the taste. The solid part of the ripe kernel is extremely nutritious, but rather indigestible. The kernels yield by expression a great deal of oil, which, when recent, is equal to that of sweet almonds; but it soon becomes rancid, and is then employed by painters. A tree generally yields about 100 nuts, in clusters near the top of about a dozen each. The wood of the tree is made into boats, rafters, the frames of houses, and gutters to

convey water. The leaves are used for thatching buildings, and are wrought into mats, baskets, etc., so that every part of it is applied to some useful end. If the body of the tree be bored, there exudes from the wound a white liquor, called *palm wine* or *toddy*. It is very sweet when fresh; kept a few hours, it becomes more poignant and agreeable; but next day it begins to grow sour, and in the space of 24 hours is changed into vinegar. When distilled, it produces the best species of Indian arrack; it also yields a great deal of sugar. Toddy is obtained from several species of palms, but that of the *Cocos nucifera* is the best. An improvement effected in the preparation of *cocoa oil* has made it of much importance in the arts, by rendering it available in the manufacture of candles and soap, and for various purposes to which it was not previously applicable. The palm oil met with in the market is the product of another palm (see PALM OIL). *Imp.* duty (fibre, leaves, shells, and oil) free.

Cocoa-Nut Oil, Shells, and **Wine.** See COCOA-NUT.

Cod [Fr. *morue*; Ger. *Kabljau*, *Bakalau*; It. *baccala*; Port. *bacalhão*; Sp. *bacalao*], the *Morhua vulgaris*, a well-known fish, possessing, in common with the other members of the genus, three dorsal and two anal fins, and a single barbel at the chin (Fig. 89). It is a widely distributed species, being found throughout the northern and temperate seas of Europe, Asia, and America, extending as far south as Gibraltar, but not entering the Mediterranean, and inhabits water from 25 to 50 fathoms deep, where it always feeds close to the bottom. It is exceedingly voracious, feeding on the smaller denizens of the ocean, — fish, crustaceans, worms, and mollusks, and greedily taking almost any bait the fisherman chooses to employ. The *C.* spawns in February and is exceedingly prolific, the roe of a single female having been known to contain upwards of eight millions of ova, and to form more than half the weight of the entire fish. Only a small proportion of these get fertilized, and still fewer ever emerge from the egg. The young are about one inch in length by the end of spring, but are not fit for the market till the second year, and it has been stated that they do not reach maturity, as shown by the forms of reproduction, till the end of the third year. They usually measure 3 feet in length, and weigh from 12 to 20 lbs., but specimens have been taken from 50 to 70 lbs. in weight. As an article of food the *C.* is in greater perfection during the three months preceding Christmas Few members of the animal creation contribute a greater mass of subsistence to the human race; still fewer are more universally serviceable than the *C.*, of which every part is applied to some useful purpose. When fresh, its beautifully white, firm, and flaky muscles furnish our table with one of the most delicious dainties; salted, dried, or otherwise conserved for future use, it affords a substantial and wholesome article of diet, for which a substitute could not readily be found. The tongue, which is always separated from the head when the fish is first caught, even epicures consider a delicacy; and tongues, salted or pickled along with the swimming-bladders, which are highly nutritious, being almost entirely pure gelatine, are held in much estimation by housekeepers, under the title of tongues and sounds. The sound or swimming-bladder of *C.*, if rightly prepared, supplies an isinglass equal to the best Russian. The liver of the cod, when fresh, is eaten by many with satisfaction, but it is more generally reserved, by fishermen, for the sake of a large quantity of fine limpid oil which it contains. (See COD-LIVER OIL.) The heads of the *C.*, after the tongues are cut out, and the gills are saved for bait, are thrown overboard, on account of want of room, and because salting would not preserve them to any advantage. Yet the head, being almost entirely composed of gelatine, is, when fresh, the richest, and perhaps the most nutritive part of the fish. The intestines of the *C.* also yield a tribute to the table; the French fishermen, especially, prepare from them a dish somewhat similar, and not far inferior to the sounds. Finally the ovaries or *roes* of the females are separated from their membranes, and the eggs, nicely pickled, afford an agreeable and gustful relish, far more delicate and inviting to the palate than the celebrated Russian caviare. In addition to these usual modes of employing the different parts of our fish, the Norwegians, Icelanders, and Kamtschadales pound up the backbones and other refuse parts, for the purpose of feeding their dogs and other domestic animals during the winter. Strange as such diet may appear, it is stated as a well-established fact, that cows, fed upon these pounded bones, mingled with a small quantity of vegetable matter, yield a larger supply and a better quality of milk than those supported upon more ordinary provender. — The usual mode of preserving *C.* for commercial purposes is by salting them immediately after they are caught, having first removed the head, bowels, etc. Those which are carefully selected and salted with greater attention to their whiteness, are usually called *dun-fish*, and bring a better price than such as are salted in bulk, with little regard to the discoloration caused by imper-

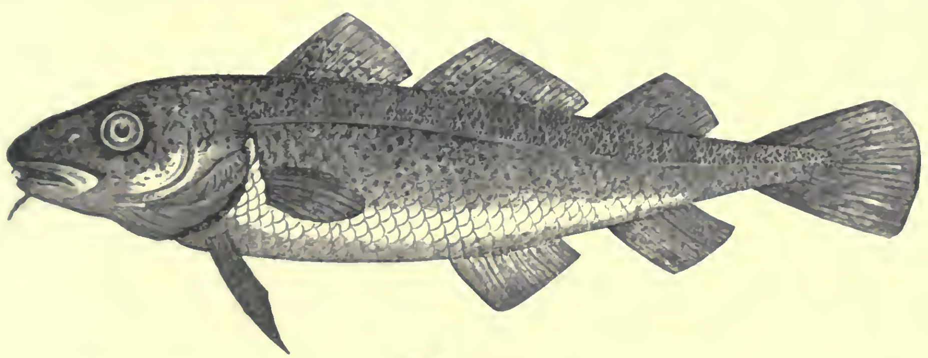


Fig. 89. — COD.

feet washing and draining before being packed. Where facilities are afforded for drying, by an adjacent shore, or by the construction of the vessel, cod are cured by drying alone, or with a very small quantity of salt. This process requires several days' exposure to sun and air, and, when skilfully conducted, keeps the fish, for an indefinite period, in a very desirable condition of whiteness and freshness, both peculiarly advantageous to the appearance of the fish at respectable tables. *C.* thus cured are called *stock-fish*, and, before being cooked, require to be softened, by soaking in water and pounding with a wooden mallet. — The great rendezvous of the *C.* fish is on the Banks of Newfoundland, and the other sand banks that lie off the coasts of Cape Breton, Nova Scotia, and New England. They prefer those situations, by reason of the quantity of worms produced in these sandy bottoms, which tempt them to resort there for food. But another cause of the particular attachment the fish have to these spots is their vicinity to the polar seas, where they return to spawn: there they deposit their roes in full security; but want of food forces them, as soon as the more southern seas are open, to repair thither for subsistence. Few are taken to the north of Iceland, but they abound on its south and west coasts. They swarm on the coasts of Norway, in the Baltic, and off the Orkney and Western Isles; after which their numbers decrease in proportion as they advance towards the south. Before the discovery of Newfoundland, the greater fisheries of *C.* were on the seas of Iceland, and off the Western Isles, which were the grand resort of ships from all the commercial nations; but the greatest plenty was met with near Iceland. The spawning season, on the banks of Newfoundland, begins about the month of March, and terminates in June; consequently the regular period of fishing does not commence before April, on account of the storms, ice, and fogs; and, indeed, many fishermen consider the middle of May as sufficiently early. After the month of June, *C.* commence their migrations to other quarters, and, of course, the fishing is suspended until the ensuing season. During the months of April and May, fresh *C.* of several species are caught, in considerable abundance, on the Atlantic coast of the U. States, as far south as the capes of Delaware, and perhaps still more to the southward. At this season, the markets of this country are, for a short time, supplied with this fine fish. The inhabitants of the northeastern cities, being near to the great fisheries, and employing vessels built for the conveyance of live fish, are liberally provided with all the luxuries obtainable from this great gift of Providence. — For regulations and statistics of the *C.* fishery, see FISHERIES.

American C. Fishing. Of the U. States, Massachusetts is the most extensively engaged in the fishery, the principal ports being those on Cape Cod, with Plymouth, Kingston, Marblehead, Beverly, and Gloucester. Maine comes next by a long interval, the principal places engaged being Portland, Wiscasset, Boothbay, Waldoborough, Belfast, Castine (employing more vessels than any other town in the State), and the ports about Frenchman's Bay. Gloucester is the great fishing port of the country. A few vessels from this town make winter trips, from three to five weeks in length, to the Western bank, the number increasing after the beginning of February. In this month also fishing commences on Georges bank (S. E. of Massachusetts), the trips averaging three or four weeks. The Georges fleet is largest in March, begins to decrease in April, and almost disappears in June. As the weather grows milder and the Georges fleet diminishes, the Gloucester vessels commence their trips to the fishing grounds off Cape Sable and Cape North, in the Gulf of St Lawrence, and on the Western Grand banks. The trips to the Grand bank rarely exceed 12 weeks in length, those to the Western banks 9 weeks. The Cape Cod vessels do not engage in winter fishing. About five sixths of them sail for the banks during the first half of April, and make two trips, or "fares," arriving on their first fare early in June, sailing again the last of that month, and arriving on their second fare the latter part of August or first of September. The remaining sixth sail about the middle of May, and make but one fare, arriving in August or September. Provincetown vessels, however, all make one long trip to the Grand bank, sailing in April, and sometimes prolonging their stay until October. Marblehead and Beverly vessels that make two fares arrive on their first fare in July or August, and on their last in November. The vessels employed are schooners of from 45 to 100 tons, averaging 60 or 70. The number of the crew varies from 9 to 14, sometimes exceeding the latter number. The bank fishermen all use dories, or flat-bottomed boats, which are sent out, usually twice a day, a short distance from the vessel, which lies at anchor on the fishing ground. The larger proportion (perhaps three fourths) of the Massachusetts vessels use trawls, which are set and hauled periodically. The trawl consists of a long line anchored and buoyed at each end, with hooks, generally several hundred in number, adjusted at intervals. The trawlers use dories about 15 ft. in length, usually carrying one for every two men. The fishermen that use hand lines carry a dory 12½ ft. long for each man except the cook, and in the largest vessels the "skipper," as the captain is called. Owing to the strong tide on Georges bank, the fishermen do not use dories there, but fish directly from the vessel. The Maine vessels carry larger crews than those from Massachusetts, and use hand lines. The trawlers use fresh bait, herring, mackerel, or squid. The hand-liners use salted clams for the first of the season, but afterwards usually obtain squid. The fish when brought aboard the vessel are dressed and salted in the hold. Upon arrival home they are taken out, washed, and dried on flakes, or platforms of wicker-work, on the shore. The process of dressing them is reduced to system, and is performed with great rapidity. The throater, usually a boy, cuts the throat and rips them open; the header removes the entrails and the head; the splitter splits the fish, removing a portion of the backbone; while the salter piles them in tiers and sprinkles them with salt. There are two principal methods of employing the crew. Under one system, a portion of them, called sharesmen, take the risk of the voyage and hire the rest of the men. These shares number from one to five, three or four being the usual number. There may be whole shares or parts of shares, the latter occurring when a portion of the compensation is at the risk of the voyage and the rest is received in wages. The hired men receive from $150 to $250 for one fare, and from $200 to $300 for two fares. The cook is usually paid from $50 to $60 a month. In settling the voyage, as it is termed, the skipper takes a small proportion of the gross stock, generally 3 per cent. The "great general supplies," consisting of salt, bait, dories, fishing tackle, etc., are then deducted; the owners of the vessels next draw one fourth: one eighth of what remains is paid for curing the fish; the provisions are then paid for; and finally the wages of the hired men are deducted. Whatever is still left is divided among the sharesmen, the skipper drawing a share in addition to his percentage. With fair success, the sharesmen will draw about 45 per cent of the gross proceeds, though the proportion varies of course according to circumstances, and they sometimes fail to pay their expenses. This system is in use on Cape Cod, and in Plymouth, Marblehead, and Beverly. By the other method the owners equip the vessel, and buy the fish green upon her arrival, at the market price for the time being. The crew receive half the proceeds, paying only half of the bait bill and of the cook's wages, having left about 45 per cent net, which in vessels that use trawls is generally divided equally, but in the case of those that use hand lines is commonly shared among the crew according to their respective catch, or on the 'own hook lay.' This system is in vogue in Gloucester. The Maine fishermen use the same method, but do not sell their fish until cured. The Nova Scotia vessels mostly use trawls. The sharesmen, six or eight in number, hire the boys and ordinary fishermen, and divide the proceeds according to the system last described." — *American Cyclopædia.*

Codilla, the coarse tow of flax and hemp.

Codiniac, a quince marmalade.

Cod-Line, an eighteen-thread line.

Codling, a small cod-fish. — A kind of apple suited for cooking.

Cod-Liver Oil, a fixed oil obtained from the fresh liver of the common cod, of which large quantities are prepared upon the coasts of Newfoundland, Nova Scotia, and New England. Oil bearing this name is also produced from the haddock, the coal-fish, the ling, and the hake. The best oil is obtained by heating the livers, broken up into a mass, by means of steam, to a temperature not exceeding 180°. The livers should be as fresh as possible. This product is called *shore oil,*

and is the purest. If the livers are left till putrefaction commences, oil rises to the surface, and if rapidly taken off, is of second quality, being known as *straits oil*. The residue left to putrefy and then boiled constitutes the *banks oil*, and is offensive both in taste and odor. Sometimes the oil is expressed, after heating the fresh livers. the product being filtered supplies a good variety of the oil. Great use is made of cod-liver oil, and especially of the coarser kinds, in the manufacture of shoe-leather, which is most conveniently dressed with this substance. But its most important economical use is as a medicine. In what manner it operates is not determined, but it is said to be one of the most valuable alteratives and restoratives in cases of scrofula and consumption. In consequence of its great value as a drug, the article is frequently adulterated with other fixed oils of animal origin, and sometimes with fixed vegetable oils. Exact chemical analysis might detect some of these adulterations, but unfortunately the process, if possible, is exceedingly delicate and uncertain. The following are, according to the best authorities, the most trustworthy tests: — The sp. gr. of genuine oil ranges between .915 and .9195 at 72°. Shark-liver oil, which is said to be substituted for the genuine article, is reported to have the sp. gr. of .866. — Genuine cod-liver oil does not congeal at 14°. — The sulphuric acid test. A drop of this acid gives a centrifugal movement to the oil, and a fine violet color, passing to a yellowish or brownish red. Sometimes the color is red at once. — The nitric acid test. This acid when agitated with the oil gives a pinkish or rose-red color, afterwards becoming brown. — The sensible qualities of odor and taste. *Imp.* duty, brown, or crude, or in barrels, or for tanners' use, 20 per cent; medical preparation, 40 per cent.

Cod-Roes, the melt or spawn of the cod-fish, salted and dried, which is shipped from Norway to France, to the extent of 20,000 to 30,000 barrels, and used as a ground bait, chiefly in the Bay of Biscay.

Coffee [Dutch, *koffy*, *koffiboonen;* Ger. *Koffe*, *Koffebohnen;* It. and Port. *caffè;* Fr. and Sp. *café*] is the berry of the *Coffea Arabica*, an evergreen shrub, with an erect slender trunk, in height from 8 to 15 feet, and having long flexible branches. The flower resembles that of the common jasmine, and the fruit is like a small red cherry, enclosing within a soft pulp the two oval seeds familiar to every one as the coffee-bean of commerce. The shrub begins to produce fruit when about 2 years old, and yields, according to its age and size, from 1 to 4 or 5 lbs.; but the quality of the produce from young plants is inferior to that from such as are 4 or 5 years old. *C.* only 2 or 3 months from the tree is not so good as that which has been kept a year; but when older it becomes deteriorated. When of good quality, the seeds or beans are hard and heavy, sink quickly in water, are of a light yellowish-green color, sweetish taste, possess in a slight degree the peculiar odor of coffee, and are free from any damp smell. The American beans are larger than those from the East. Before being used for domestic purposes they are roasted, a process by which they are increased to nearly twice their original size, while they lose about one third of their weight. *C.* is very apt to imbibe moisture, or the flavor of any thing placed near it; much attention is therefore necessary in packing it on board ship or otherwise. The early history of *C.* as an economical product is involved in considerable obscurity. Its use as a beverage seems to have been prevalent among the Abyssinians from the most remote period, and in Arabia the beverage when first introduced (about the beginning of the 15th century) only supplanted a preparation from the leaves of the *Celastrus edulis*. Its peculiar property of dissipating drowsiness and preventing sleep was taken advantage of in connection with the prolonged religious services of the Mahometans, and its use as a devotional antisoporific stirred up a fierce opposition on the part of the strictly orthodox and conservative section of the priests. Though all manner of devices were adopted to check its growth, the *C.*-drinking habit spread rapidly among the Arabian Mahometans, and the growth of *C.* as well as its use as a national beverage became as inseparably associated with Arabia as tea is with China. For about two centuries the entire supply of the world, which, however, was then limited, was obtained from the prov. of Yemen in S. Arabia, where the celebrated Mocha or Mokha is still cultivated. The knowledge of and taste for *C.* spread but slowly outwards from Arabia Felix, and it was not till the 16th century that *C.*-houses were established in Constantinople. After the lapse of another century *C.* reached England, a *C.*-house having been opened in London in 1652. A Turkey merchant, of the name of Edwards, having brought along with him from the Levant some bags of *C.*, and a Greek servant accustomed to make it, his house was thronged with visitors to see and taste this new sort of liquor; and, wishing to gratify his friends without putting himself to inconvenience, he allowed his servant to make and sell *C.* publicly. In consequence of this permission, the latter opened a *C.*-house in Newman's Court, Cornhill. Garraway's was the first house opened after the great fire in 1666. Charles II. attempted, by a proclamation issued in 1675, to suppress *C.*-houses, on the ground of their being resorted to by disaffected persons, who "devised and spread abroad divers false, malicious, and scandalous reports, to the defamation of his Majesty's government, and to the disturbance of the peace and quiet of the nation." The opinion of the judges having been taken as to the legality of the proceeding, they resolved, "That retailing *C.* might be an innocent trade; but as it was used to nourish sedition, spread lies, and scandalize *great men*, it might also be a common nuisance!" M. de la Roque mentions that the use of *C.* was introduced into France between 1640 and 1660; and he further states that the first *C.*-house for the sale of coffee in France was opened at Marseilles, in 1671. It was hardly, however, known, except to a few travellers who had visited the East, till 1669, when it was introduced to the best society in Paris by Solyman Aga, ambassador from the Grand Seignior to Louis XIV. It immediately became fashionable; and the taste for it having been quickly diffused, a *C.*-house was opened for its sale in 1672, which, in no long time, had several competitors. Some time between 1680 and 1690 the Dutch planted in the vicinity of Batavia *C.*-

Fig. 90 — COFFEE PLANT.

beans they had procured from Mocha. In 1690 they sent a plant to Europe; and it was from berries obtained from this plant that the first *C.* plantations in the West Indies and Surinam were derived. The cultivation of *C.* is now general throughout all civilized regions of the tropical world. In point of quantity Brazil heads the list of *C.*-growing countries, its annual produce probably exceeding that of all other localities combined. It is calculated that no less than 530,000,000 *C.* trees are at present flourishing throughout the empire. In 1878 more than 2,000,000 bags, each containing 160 lbs., were exported from Brazil; and the U. States alone absorb upwards of 200,000,000 lbs. of Brazilian *C.* annually. The other principal American localities for *C.*-growing are Costa Rica, Guatamala, Venezuela, Guiana, Peru, and Bolivia, with Jamaica, Cuba, Porto Rico, and the West India islands generally. In the East, the principal *C.* region, following Brazil in amount, but much superior in the quality of their produce, are Java and Ceylon. The annual produce of Java reaches to about 130,000,000 lbs.; and for Ceylon about 100,000,000 lbs. is annually exported. The culture of *C.* is an important and rapidly growing feature in S. India, and it is also prosecuted in Sumatra, Réunion, Mauritius, and S. Arabia, and on the W. coast of Africa. The present annual production of the world has been estimated to amount at no less than 1,000,000,000 lbs., principally consumed in the following countries: —

	Total import of *C.* for consumption.	Average per head.
Holland	72,395,800	21.00 lb.
Denmark	26,035,652	13.89 "
Belgium	49,771,000	13 48 "
Norway	17,636,080	9.80 "
Switzerland	18,779,500	7.03 "
Sweden	26,555,213	6.11 "
United States	309,956,493	6.05 "
France	98,635,000	2.73 "
Austria	76,876,576	2.13 "
Greece	2,131,337	1.42 "
Great Britain	32,330,928	1.00 "
Italy	28,511,560	1.00 "
Russia (European)	14,740,920	0.19 "
Hamburg (Germany)	178,715,936	?

In the London market the established distinctions relate — first, to qualities, as "fine," "middling," "ordinary," "low," and "triage," the last being broken and damaged seeds; and secondly, to localities of production. In New York, the grades are expressed by the terms *prime, good, fair,* and *ordinary;* and the places of production (as much as can be judged from relative prices) rank as follows: — Mocha, Java (Padang) * Singapore, Ceylon (native), Laguayra, Manilla, Maracaibo, Costa Rica, Mexico, Brazil, and St. Domingo. — Shape, size, and color of seeds are the principal elements which determine the commercial value of *C.* Shape is related to the particular part of the plant upon which the seed grows; size and succulence correspond with the nature of the locality of growth; and color has reference to the degree of maturity attained by the fruit at the time of gathering. The highly-prized variety known as *peaberry* is the result of the coalescence of a single rounded seed, usually of small size, whence the name.

* The U. States consumes about three fourths of the entire shipment of *C.* from the State of Padang (Sumatra), and comparatively little straight Java *C.* finds its way hither, the Sumatra bean being called Java throughout all branches of the trade in this country.

Regarding the famous Arabian *C.* and the English market Mr. W. G. Palgrave, in his *Central and Eastern Arabia*, has the following remarks: — "The best *C.*, let cavillers say what they will, is that of Yemen, commonly called *Mokha*, from the main port of exportation. Now I shall be sorry to incur a lawsuit for libel or defamation from our wholesale or retail tradesmen; but were the particle *not* prefixed to the countless labels in London shop windows, that bear the name of the Red Sea haven, they would be more trustworthy than they are now. Very little, so little indeed as to be quite unappreciable, of the Mokha or Yemen berry ever finds its way westward of Constantinople. Arabia itself, Syria, and Egypt, consume fully two-thirds, and the remainder is almost exclusively absorbed by Turkish and Armenian œsophagi. Nor do these last get for their share the best or the purest. Before reaching the harbors of Alexandria, Jaffa, Beyrout, &c., for farther importation, the northern bales have been, while yet in their way, sifted and resifted, grain by grain, and whatever they may have contained of the hard, rounded, half-transparent, greenish-brown berry, the only one really worth roasting and pounding, has been carefully picked out by experienced fingers; and it is the less generous residue of flattened, opaque, and whitish grains which alone or almost alone, goes on board the shipping. So constant is this selecting process that a gradation, regular as the degrees in a map, may be observed in the quality of Mokha, that is, Yemen *C.* even within the limits of Arabia itself, in proportion as one approaches to or recedes from Wadi Nejran and the neighborhood of Mecca, the first stage of the radiating mart."

"The successful culture of the *C.* plant in any portion of the U. States is exceedingly problematical. There is a constant demand for plants for experimental purposes, which the Department is unable to supply, owing to the difficulty of procuring fresh seed. It is barely possible that in S. California, or in S. Florida, localities may be found where it may succeed; but these are the only regions where further experiments in *C.*-culture need be made. Authorities on *C.*-production very generally coincide in the opinion that it cannot be profitably grown in any climate where the temperature falls as low as 50° F. at any period of the year. Since the introduction of *C.*-culture in Liberia, attention has been directed to the superior size of the berry produced in that country. For a time it was supposed to be one of the varieties of *Coffea Arabica*, of which several are known to exist in Abyssinia and Central Africa; but more recent investigations have placed it as a distinct species, which has been named *Coffea Liberica.* Efforts are now being made to introduce this species into *C.*-growing regions, on account of its supposed immunity from the rust, a fungoid disease that has greatly impaired the value of the *C.*-crop in some of the best plantations in various parts of the world. This Liberian species is said to be of larger and of more robust growth than any other cultivated kind. Whether it will prove to be hardier, or mature its fruit in climates of lower temperature, remains to be seen." (Report of the Commissioner of Agriculture, 1876.)

The physiological and dietetic value of *C.* depends principally upon the alkaloid caffeine which it contains. Its commercial value is, however, determined by the amount of the aromatic oil, *caffeone,* which develops in it by the process of roasting. By prolonged keeping it is found that the richness of any seeds in this peculiar oil is increased, and with increased aroma the *C.* also yields blander and more mellow beverage. Stored *C.* loses weight at first with great rapidity, as much as 8 per cent having been found to dissipate in the first year of keeping, 5 per cent in the second, and 2 per cent in the third; but such loss of weight is more than compensated by improvement in quality, and consequent enhancement in value. In the process of roasting *C.*-seeds swell up by the liberation of gases within their substance, — their weight decreasing in proportion to the extent to which the operation is carried. Roasting is an operation of the greatest nicety, and one, moreover, of a crucial nature, for equally by insufficient and by excessive roasting much of the aroma of the *C* is lost, and its infusion is neither agreeable to the palate or exhilarating in its influence. The roaster must judge of the amount of heat required for the adequate roasting of different qualities; and, while that is variable, the range of roasting temperature proper for individual kinds is only narrow. In France, it is the custom to roast in small quantities, and thus the whole charge is well under the control of the roaster; but in

America large roasts are the rule, in dealing with which much difficulty is experienced in producing uniform torrefaction, and in stopping the process at the proper moment. The roasting of *C.* should be done as short a time as practicable before the grinding for use, and as ground *C.* especially parts rapidly with its aroma, the grinding should only be done when *C.* is about to be prepared. Any ground *C.* which may be kept should be rigidly excluded from the air. The prevailing fault of the *C.* made in America is its want of strength and flavor. The *C.*-pot should be heated previously to putting in the *C.*, which may be done by means of a little boiling water. The common practice of boiling *C.* is quite unnecessary, for all its flavor and aroma is readily extracted by boiling hot water. Indeed, all the useful and agreeable matter in *C.* is very soluble, it comes off with the first waters of infusion, and needs no boiling. Should prejudice, however, induce the housewife or cook to boil her *C.* it should be only just simmered for a minute, as long or violent boiling injures it considerably. When *C.* is prepared in a common pot, the latter being first made hot, the boiling water should be poured over the powder, and not, as is commonly the plan, put in first. It should then be kept stirred for 4 or 5 minutes, when a cup should be poured out and returned again, and this operation repeated 3 or 4 times, after which, if allowed to repose for a few minutes, it will generally become fine of itself. In all cases, where a percolator is not used, the liquid should be well stirred up several times before finally covering it up to settle for use. Amongst the various description of *C.*-pots in use we may mention those of French make, consisting of two cylindrical vessels, the upper having a metal strainer, on which the ground *C.* is placed, and through which the clear infusion runs into the lower one. *C.* is sometimes clarified by adding a shred of isinglass, a small piece of clean eel or sole skin, or a spoonful of white of egg. An excellent plan, common in France, is to place the vessel containing the made *C.* upon the hearth, and to sprinkle over its surface half a cupful of cold water, which from its greater gravity descends, and carries the "foulness" with it. Another plan sometimes adopted is to wrap a cloth, previously dipped into cold water, round the *C.*-pot. This method is commonly practised by the Arabians and rapidly clarifies the liquor, unless a very large quantity of chicory is present. It should be recollected that the use of isinglass, white of egg, and all like artificial finings, remove much of the astringency and vivacity of the liquor. The French, who are remarkable for the superior quality of their *C.*, generally allow one ounce to each large *C.*-cupful of water, and they use the *C.* both newly ground and freshly roasted. A shred of saffron, or a little vanilla, is frequently added, whilst the percolating *C.*-pot is generally employed. — *C.* belongs to the medicinal or auxiliary class of food substances, being solely valuable for its stimulant effect upon the nervous and vascular system. It produces a feeling of buoyancy and exhilaration comparable to a certain stage of alcoholic intoxication, but which does not end in depression and collapse. It increases the frequency of the pulse, lightens the sensation of fatigue, and it sustains the strength under prolonged and muscular exertion. The value of its hot infusion under the rigors of arctic cold has been demonstrated in the experience of all arctic explorers, and it is scarcely less useful in tropical regions, where it beneficially stimulates the action of the skin.

Adulteration. The principal substances used for the purposes of adulteration are caramel, roasted chicory, roasted locust leaves, roasted corn, &c. If you contrast *C.* with chicory, we at once see the vast superiority of the former over the latter, thus: — *C.* is the fruit of a tree, whilst chicory is the root of an herbaceous plant, and it is well known that more virtues exist in fruits and seeds than in roots. *C.* contains three active principles, viz. an essential oil, caffeia, and tannic acid, and these exercise a powerful influence on the system, retarding the waste of the tissues of the body, exciting the brain to increased activity, and exhilarating without intoxicating. Chicory contains none of these constituents. *C.* exerts on the system highly beneficial physiological effects; chicory possesses medicinal properties, which are not desirable in an article of food. Chicory, therefore, is very objectionable, and when a dealer sells a mixture of coffee and chicory for pure *C.*, as is almost invariably the case, he is guilty of selling an adulterated article, and ought to be punished accordingly. The adulteration with caramel or chicory may readily be detected as follows: — 1. A spoonful of pure *C.* placed gently on the surface of a glass of cold water will float for some time, and scarcely color the liquid; if it contains caramel or chicory, it will rapidly absorb the water, and, sinking to the bottom of the glass, communicate a reddish-brown tint as it falls. Another method of applying this test is by expertly shaking a spoonful of the suspected *C.* with a wine-glassful of cold water, and then placing the glass upon the table. If it is pure, it will rise to the surface, and scarcely color the liquid; but if caramel or chicory is present, it will sink to the bottom, and the water will be tinged of a deep red as before. 2. The brown color of decoction or infusion of roasted *C.* becomes greenish when treated with a per-salt of iron; and a brownish-green, flocculent precipitate is formed. The color of chicory is only deepened, but not otherwise altered, and no precipitate is formed under the same treatment. A mixture of chicory and coffee retains a brownish-yellow color after the precipitate has subsided, and the liquid appears brownish yellow by refracted light. The addition of a little weak ammonia water aids the subsidence of the precipitate. 3. Under the microscope (see CHICORY) the presence of chicory may be readily detected by the size, form, and ready separation of the cells of the cellular tissue, and by the presence and abundance of the pitted tissue or dotted ducts, which are absent from *C.*, and by the size of the spiral vessels which are very small in *C.* The most characteristic structure, however, and that by which chicory can be easily identified, is the lactiferous tissue. Roasted corn, and other amylaceous substances, may also be detected, in the same way, by the peculiar size and character of their starch-grains. Under the microscope the berry is seen to consist of a hard, tough tissue, that resists even long soaking. The testa covering the berry is made of lengthened cells with oblique markings resting on a thin membrane, almost structureless. These oblique markings of the cells are so characteristic as to render the cells distinguishable from every other tissue. The substance of the berry consists (Fig. 91) of angular cells, each one of which contains minute drops of oil. This oil is in some measure driven off during the process of roasting, which, however, leaves the structure unimpaired when it is not charred. — Roasted corn, beans, &c., may be detected by the cold decoction striking a blue color with tincture of iodine. Pure *C.* is merely deepened a little in color by this substance.

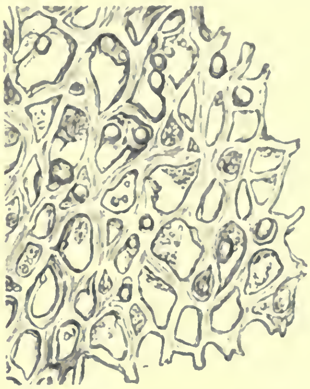


Fig. 91.—MICROSCOPIC APPEARANCE OF COFFEE.

American trade. *C.* ranks second in the order of value among imports into the U. States. There were imported during the 5 years from 1854 to 1858, inclusive, 1,019,487,445 lbs. of *C.*, and during the 5 years from 1874 to 1878, inclusive, 1,584,453,686 lbs., an increase of 564,966,241 lbs., or 55.42 per cent. The quantity imported from each foreign country in 1878, was as follows: —

COUNTRIES.	Quantities.	Per cent of total.
	Pounds.	
Brazil	211,654,160	68.30
Venezuela	38,623,291	12.46
Dutch East Indies	14,573,766	4.70
Central American States	13,868,955	4 48
Hayti	12,813,113	4.13
Mexico	6,337,063	2.04
United States of Colombia	5.931,709	1.91
British West Indies and Honduras	2,340,187	0.76
England	1,309,785	0.42
British East Indies	1,269,557	0.41
China	331,893	0.11
Netherlands	156,034	0.05
Hawaiian Islands	150,194	0.05
Liberia	107,500	0.04
Chili	106,356	0.04
Porto Rico	105,856	0.04
Dutch West Indies and Guiana	44,939	0.01
British Possessions in Africa	36,794	0.01
All other ports in Africa	33,452	0.01
Spanish Possessions, all other	32,125	0.01
All other countries	55,811	0.02
Total	309,882,540	100.00

The exports of *C.* in 1878 were 12,821,426 lbs., valued $2,-086,366.

Quantities and values of C. retained in the U. States for consumption, and estimated consumption per capita of population during the years 1830, 1840, 1850, 1860, *and from* 1870 *to* 1878 *inclusive:* —

Year.	Retained for home consumption.		Consumption per capita.
	Pounds.	Dollars.	Pounds.
1830	38,363,687	3,180,479	3.0
1840	86,297,761	7,615,824	5.05
1850	129,791,466	9,918,472	5.55
1860	182,049,527	19,615,106	5.8
1870	253,571,665	25,630,715	6.6
1871	294,930,949	29,428,698	7 5
1872	239,735,830	26,140,240	5 9
1873	401,975,241	58,051,714	9.6
1874	285,569,219	55,034,302	6.7
1875	317,017,310	50,448,852	7.2
1876	338,548,996	56,825,513	7.5
1877	332,005,637	53,634,199	7.1
1878	309,956,493	51,914,622	6.5

Statement of Stock at all Ports (not including California, for which see SAN FRANCISCO), *1st January*, 1879: —

At New York,	of Brazil .....bags	106,383
"	of Maracaibo	3,300
"	of Laguayra	2,622
"	of St. Domingo	3,297
"	of Savanilla	2,310
"	of Angostura	1,264
"	of Jamaica	800
"	of African	336
"	of Costa Rica	279
"	of Mexican	188
"	of Curaçao	100
"	of Java....mats	22,507
"	of Singapore	5,870
Total at New York....pkgs		149,256
At Baltimore — Brazil		35,227
New Orleans — Brazil, etc		6,605
Other ports — Brazil, etc		21,190
Total....pkgs		212,278
Total weight....tons		11.535
Stock, Jan. 1, 1878		13,181
Decrease in stock....tons		1,646

Yearly Average Price per 100 *lbs. in the New York Market of Fair to Prime Cargoes of Brazil C.:* —

1878	$16.51	1868	$15.73	1858	$10.96
1877	19.72	1867	17.24	1857	11.04
1876	17.97	1866	18.66	1856	11.03¼
1875	19.01	1865	20.65	1855	10.41
1874	21.08	1864	42.49	1854	10.41
1873	19.99	1863	31.18	1853	9.77
1872	18.42	1862	23.01	1852	8.84
1871	15.91	1861	14.01	1851	9 41
1870	16.33	1860	13 60	1850	10.79
1869	15.82	1859	11.61		

Yearly average prices of other *C.* at New York for 3 years: —

	1878.	1877.	1876.
Java (Padang)	$22.48	$23.82	$21.57
Maracaibo and Laguayra	15.52	18.92	17 02
St. Domingo	13.34	16.40	15.18

Not many years ago it was held that the consumption of *C.* had very nearly, if not quite, overtaken the production, and prices in consequence advanced until they were far above anything before known since the bean became an article of commerce. The extraordinary returns received by the planter of late years were incentives to an extension of the culture of the tree; and now it seems that, with multiplied plantations in many of the *C.*-growing countries, production, as a whole, is again not only well abreast of consumption, but even some steps in advance of it, and a return to the extreme values, such as ruled for the lustrum ending with 1877, cannot be expected in the immediate future, or until the consuming world again overtakes and outstrips the yield of the producing countries. At the same time there is even less probability of a return to the low level of market values that ruled in the decade ending with 1850. — *Imp. duty. C.* was taken from the free list August 6, 1861, and a duty imposed of 4 cents per lb.; duty increased Dec. 25, 1861, to 5 cents per lb.; duty reduced Jan. 1, 1871, from 5 cents to 3 cents per lb.; and duty abolished July 1, 1872.

Coffee-Biggin, a coffee-pot with a flannel bag (now generally replaced by a wire-strainer) to contain the ground-coffee through which the boiling water is poured.

Coffee-Canister, a tinned receptacle for holding ground roasted coffee.

Coffee-Filter, a straining machine for clearing coffee when prepared as a beverage. See PERCOLATOR.

Coffee (Essence of), a highly concentrated infusion of coffee, prepared by percolation with boiling water, gently and quickly evaporated to about ⅛ or ¼ of its bulk, and mixed with a thick aqueous extract of chickory and syrup of burnt sugar, so as to give the whole the consistence of treacle. The proportions of the dry ingredients should be, — coffee, 4 parts; chickory, 2 parts; burnt sugar (caramel) 1 part. It should be kept in well-corked bottles in a cool place. This preparation is very convenient for making extemporaneous coffee; but the beverage so made, though superior to much of that sold at coffee-houses, is inferior in flavor, aroma, and piquancy, to that we are accustomed to drink at home. Much of the so-called "Essence of Coffee" is simply treacle and burnt sugar, flavored with coffee.

Coffee-Leaves. The leaves of the coffee-tree contain caffein in larger proportion than the seeds themselves, and their use as a substitute for tea has frequently been suggested. Its leaves are actually so used at Sumatra, but being destitute of any attractive aroma such as is possessed by both tea and coffee the infusion is not palatable.

Coffee-Mill, a hand-mill in which roasted coffee-berries are ground by passing between the serrated surfaces of opposed steel rollers.

Coffee-Pot, a metal vessel in which ground coffee is boiled or infused.

Coffee-Pulper, a machine for preparing coffee-berries for shipment, by removing the pulp and parchment.

Coffee-Roaster, a tradesman who prepares the raw coffee-berries for use. — Also the revolving machine in which coffee is roasted.

Coffer, a chest. — A lock for receiving a barge.

Coffer-Dam [Fr. *bâtardeau*; Ger. *Fangdamm*], a water-tight enclosure, within which the construction of hydraulic works, such as the foundations of bridges, pier, or quay, can be securely carried on.

Coffin [Fr. *cercueil*; Ger. *Sarg*], a wooden or other shell or receptacle for the dead. Although usually made of wood or lead, *C.* have been made of glass and slate. — In printing, the wooden frame

enclosing the composing-stone. — In milling, one of the sockets in the eye of the runner, which receives the ends of the driver.

Coffin-Furniture, the handles, metal ornaments, etc., affixed to a coffin for decoration, which are usually white or black, though occasionally gilt.

Cog-Wheel is a toothed wheel whose teeth, consisting of *cogs* or pieces of wood inserted into mortises in the face of the wheel, mash into the teeth of another wheel, so as to receive or impart motion. There are many varieties of *C.-W.* The one represented in Fig. 92, usually called *rag* or *sprocket* wheel, communicates motion to another wheel perpendicular to it, and which, from its peculiar form, is called *lantern* wheel.

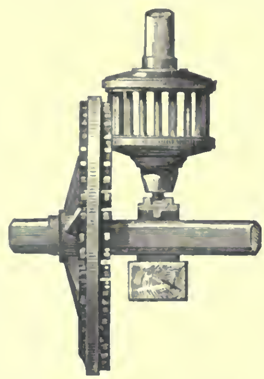


Fig 92. — Cog and Lantern Wheels.

Cognac. See Brandy.

Cog-Wood, a name for the *Laurus chloroxylon*, which from its durability in water is used in the West Indies for mill-framing and cog-wheels.

Cohong, the Chinese name for a company.

Coiffure, the French name for head-dress, *coiffeur* being a hair-dresser.

Coil, lead pipe, rope, chain, etc., curled or wound up in a series of rings, for convenience of handling or packing.

Coin, a piece of metal, most commonly gold, silver, copper, or nickel, stamped by authority, and made current as money. See Money.

Coinage. See Mint.

Coining-Press, a powerful lever screw, for impressing devices, legends, etc., on current coin, medals, etc.

Coir, the commercial name of the short fibre obtained from the dry husk or covering of the cocoa-nut, which is largely used in the manuf. of cordage, matting, etc., and to stuff beds, chair-bottoms, etc. From Ceylon alone more than 60,000 cwt. is shipped annually. The varieties of *C.* entering the market are *C.* yarn, *C.* junk, and *C.* fibre. The goodness of *C.* depends on the fineness of the filaments, and on their being of a bright yellow color. *C.* cables are much used in merchant vessels, the *C.* rope having been employed in India for ages. The rope is so light that it floats on the water; and a *C.* hawser ought to be kept in every vessel, since if a small boat is attached to it, and let down when a man falls overboard, it gives him greater facilities for saving life than any other means. Fresh water is said to rot *C.*, and the rope snaps easily in frosty weather. *C.* ropes are therefore unsuitable for low latitudes. The rope, however, in sea water and high latitudes is actually strengthened and rendered more elastic by exposure. *Imp.* duty, *C.* and *C.* yarn, free. See Mat and Matting.

Coke, the carbonaceous residue produced when coal is subjected to a strong red heat, out of contact with the air, until the volatile constituents are driven off. It consists essentially of carbon, the so-called fixed carbon, together with the incombustible matters or ash contained in the coal from which it is derived. In addition to these it almost invariably contains small quantities of hydrogen, oxygen, and nitrogen, the whole, however, not exceeding 2 or 3 per cent. It also contains water, the amount of which may vary considerably according to the method of manufacture. When produced rapidly and at a low heat, as in gas-making, it is of a dull black color, and a loose spongy or pumice-like texture, and ignites with comparative ease, though less readily than bituminous coal, so that it may be burnt in open fire-places; but when a long-continued heat is used, as in the preparation of *C.* for iron and steel melting, the product is hard and dense, is often prismatic in structure, has a brilliant semi-metallic lustre and silvery-gray color, is a good conductor of heat and electricity, and can only be burnt in furnaces provided with a strong chimney-draught or an artificial blast. The strength and cohesive properties are also intimately related to the nature and composition of the coals employed, which are said to be caking or non-caking according to the compact or fragmentary character of the *C.* produced. *C.* is used for all purposes where a smokeless fire is required, as, for instance, in drying malt or hops, or in raising steam in locomotives within the limits of towns, also for producing strong local heat, as in melting metals (gold, silver, brass, or steel) in crucibles in air furnaces. In blast furnaces its value depends upon the difficulty of combustion, so that the particles keep their own form until they reach the proper places of combustion at the point of entry of the blast in the lower part of the furnace. Fine ground *C.* is used mixed with clay for making crucibles for steel melting, and also for filling the hearths of blast furnaces in many German smelting-works. Apart from its convenience for special purposes, *C.* is not an economical fuel, the useful heating effect being about the same as that of an equal weight of coal. This circumstance has led to the nearly general abandonment of *C.* and the substitution of raw coal as fuel in locomotive engines on railways. *Imp.* duty, 25 per cent.

The Connellsville Coke Region. Of the coking coal fields of the U. States, the most important is the Connellsville. It is situated in the S.W of Pennsylvania, lying mainly in the counties of Westmoreland and Fayette, and some 50 to 60 m. from Pittsburgh. The field occupies a triangle some 3 m. wide and 50 m. long, almost without a fault, the beds yielding from 8 to 9 feet of workable coal. The continuation of the Pittsburgh area of the bed with the Connellsville area is broken off by the Youghiogheny, the bed taking an upward course and descending again, the intermediate portion being swept away. This has led to a popular belief that the bed at Connellsville is different from the bed at Pittsburgh, but careful surveys have established their identity. It is a fact, however, that at Pittsburgh this bed is not in the best condition, while at Connellsville it is at its largest size and finest quality In the Connellsville basin, the coal ranges from 8 to 11 feet in thickness, with one small slate parting the " bearing in slate " 18 inches above the floor The roof is only passable; rooms can only be run 12 feet wide, and the pillars left will average 10 feet, a large amount of which is lost in drawing. The floor is even and quiet, and the coal of a remarkably good and uniform character, soft and easily mined. The coal is Bituminous, with generally a dull resinous lustre, alternating with seams of bright, shining crystalline coal, coated with a yellowish silt. It contains numerous particles of slate, and some crystals of pyrites. It is compact, with a tendency to break up into cubes Such a coal, from the mines of Messrs H. C. Frick & Co, at Broad Ford, is taken by the Pennsylvania Geological Survey as the typical coal of the Connellsville basin. The *C.* from this region is of a silvery lustre, cellular, with a metallic ring, tenacious, comparatively free from impurities, and capable of bearing a heavy burden in the furnace. Its porosity and ability to " stand up " in the furnace are what have given it such a reputation for a blast-furnace fuel, and has created such demand for it for mixing with Anthracite and Bituminous coal in the East and West, especially where an open iron, such as is used in the Bessemer process, is needed.

In coking the coal, the beehive oven is in universal use in the Connellsville region. These ovens vary, at the different works, from 11 to 12 feet in diameter, and from 5 to 6 feet in height. The working is very simple. The coal is dumped through an opening in the crown of the furnace, and spread evenly on the floor, to the average depth of 2 feet for 48-hour *C.*, and 2½ feet for 72-hour. The front opening, through which the *C.* is discharged, is at first nearly closed with brick, luted with loam. The heat of the oven from the previous coking fires the charge, and as the coking progresses the air is more and more shut off by luting the openings, and finally closing the roof openings. The average charge is 100 bushels of coal at 76 lbs., and the yield in *C.*, 120 bushels at 40 lbs., making the percentage yield 63, or 1.6 tons of coal to 1 ton of *C.* The average time of coking is 48 hours, with 72 hours for that burned over Sunday; 24-hour *C.* is sometimes made. The 72-hour *C.* is firmer *C.* than either of the others, but it is questionable whether it is a better furnace *C.* When the *C.* is thoroughly burned, the door is removed, and the *C.* is cooled by water thrown in from a hose, and then drawn.

The statistics of this trade are surprising. The manufacture began in the winter of 1841-2 According to the latest information we have, there are 3,668 ovens in the Connellsville region, and nearly all are in operation. The annual product at present is about 1,500,000 tons.

Coke-Oven. See Coke.

Coker-Canvas, a kind of sail-cloth made in Crewkerne, Somersetshire, England.

Coker-Nut, a modern mode of spelling cocoanut, in commercial circles, in order to make a broader distinction between the numerous articles spelt much in the same manner.

Colaga, a variable Eastern grain-measure; that used in Canara is nearly equal to a bushel; in Seringapatam it is 11 bushels; in Bangalore it is but 11 lbs. 13 oz. 6¾ drachms. It is also called a coodom, and is divided into four bullahs.

Colander, a metal or earthenware strainer.

Colchester. See Great Britain.

Colchicum, Meadow Saffron, the dried corms or bulbs, and also the seeds of *C. autumnale*, used in medicine, and forming the base of almost all the advertised gout-nostrums. It is, however, an active poison, and its administration requires care.

Colcothar, a chemical preparation from oxide of iron, the brown peroxide. See Rouge.

Cold-Chisel, a strong iron tool for cutting metal.

Cold-Cream, a snow-white, bland ointment, about the consistence of good lard, and an admirable substitute for that excipient where expense is no object, especially for applications about the face. It is commonly sold as a lip-salve, and as a healing application to abraded and chapped surfaces generally.

Cold-Drawn, a term applied to oil expressed from nuts or seeds which have not been previously heated, to distinguish it from oil expressed from heated nuts or seeds, which last is inferior in quality.

Cold-Short, a term applied to a metal, as iron containing phosphorus, which, being brittle when cold, becomes malleable when heated. — In casting, a void or seam caused by the metal failing to fill perfectly the mould, in consequence of its too rapid congelation.

Cole-Seed. See Colza.

Colewort, a kind of cabbage.

Colijeerah, a native name in India for black cumin seed.

Colis [Fr.], a package or bale of goods.

Collar, a circlet for the neck. There are *C.* of various kinds manufactured, —horse *C.*, which are iron frames covered with leather, and padded or stuffed; men's *C.* of stitched linen, also of paper; ladies' lace, muslin, and other worked *C.* The part of a garment which fits close round the throat is called the *C.* — In turning, a ring inserted in the puppet for holding the end of the mandril next the chuck, in order to make the spindle run freely and exactly. — In machinery, a plate of metal screwed down upon the stuffing-box of a steam-engine, with a hole to allow the piston-rod to pass through. — In mining, the timber and boarding used to secure the uppermost part of a shaft in loose rubble from falling in. — On shipboard, an eye in the end or bight of a shroud or stay, to go over the mast-head; also a strap formed of rope, to which the dead-eyes are secured.

Collar-Check, a rough cross-barred woollen material for saddlery purposes, made either broad or narrow.

Collate, to collect and examine the sheets of book-work, etc., before being sent out, or previously to their being arranged for binding.

Collation, an afternoon luncheon.

Colle, the French name for glue, size, paste.

Colle de Poisson [Fr.], isinglass.

Collector, an authorized receiver who applies for or is paid certain moneys, whether for individuals, societies, corporations, or the State; as of customs, city dues, market revenues and toll, gas and water rates, etc. Sometimes collectors are paid fixed salaries; at other times they are paid a commission or poundage on the sums received. In the U. States, "the chief officer of a collection district, or custom-house, known as *C.* of Customs, receives his appointment from the President and Senate. It is an office of great responsibility, respectable salary, large perquisites, and extensive patronage. Hence, it is considered a political office, and hardly any *C.* holds office long enough to become even tolerably well acquainted with its complicated duties. Fortunately, however, at the larger ports especially, much of the responsibility and most of the labor is performed by deputy collectors, who, from their experience and knowledge of the business, and their very moderate salaries, are less liable to be affected by the political changes of the government." — *T. McElrath.*

Collet, in jewelry, the part of a ring containing the bezel in which the stone is set.

Collier, a miner, one engaged in a coal mine; also the name for a vessel which carries coals.

Collier Bead, a large bead, usually white, a principal article of trade on some parts of the coast of Western Africa. They are sometimes called Bokola beads.

Colliery, a seat of coal seams; a coal mine, with all buildings, machinery, and all appurtenances belonging thereto. See Coal.

Collision at Sea [Fr. *abordage*], in commercial navigation, the shock of two ships coming into sudden and violent contact at sea, by which one or both may be more or less injured. At common law, every master of a ship is bound to keep a proper watch at sea, especially in channels much frequented by shipping, and to use every precaution to avoid coming into contact with other vessels. This matter, however, was judged too important to be left wholly to depend on the good sense and care of individuals; and with a view to the securing of attention to the subject, and to the obviating of the confusion that would unavoidably arise were shipmasters left to follow their own ideas with respect to it, rules and regulations have been laid down in England in regard to the courses to be steered when ships are passing each other, the signals to be made during fogs, the number and description of the lights to be exhibited at night, and other particulars. There is no especial statute law in the U. States on this subject, and the American courts of admiralty follow, in a

measure, the English law embodied in the Merchant Shipping, etc., Amendment Act of 1862, the 25 and 26 Vict. c. 63, and are governed by the precedents they have established. The conditions under which cases of collision take place differ extremely. Thus: — 1. It may be merely accidental, or be occasioned by circumstances beyond the power of control, as by the violence of the wind or waves dashing or impelling the ships together, without blame being imputable to either party; or 2. It may be owing to the culpable negligence or misconduct of one party; or 3. Both parties may be to blame. In adjudicating upon losses growing out of collisions that have taken place under such different circumstances, the conclusions must also be very different.

With respect to the first class of cases, there is little apparent difficulty: wherever a loss is occasioned by a storm, a fog, or other accidental circumstance, without any blame being ascribable to either party, it would appear to be equitable that it should be borne by the sufferer. And this principle having been embodied in the Roman law, was subsequently ingrafted into that of England. (Marshall *On Insurance*, ch. xii., sec. 2.) But other authorities, to whom the greatest deference is due, contend that the loss arising from accidental collisions, however it may affect the parties, should be equally divided between them; and this, in fact, is the rule followed in most maritime States. (*Ordonnance* of 1681, lib. iii., tit. xii., art. 10, with the observations of Valin.) It also is the rule sanctioned by the law of England in cases where both parties are to blame, but where the blame cannot be discriminated. Those cases in which the blame is clearly ascribable to either party present no difficulty. In apportioning the damage in cases where both parties have been in fault, the question occurs whether the damage done to the cargo shall be taken into account or left out in the estimate on which the apportionment is to be made. This knotty point has been differently decided in different countries. But the rule which limits the liability of owners to the value of the ship and freight applies to cases of damage by collision. See OWNERS.

REGULATIONS FOR PREVENTING COLLISIONS AT SEA, appended to the English Order in Council, dated Jan. 3, 1863, which apply to all ships belonging to the following countries and places, whether within British jurisdiction or not: — Austria, Argentine Republic, Belgium, Brazil, Bremen, Chili, Denmark Proper, France, Germany, Great Britain, Greece, Hawaiian Islands, Hayti, Italy, Morocco, Netherlands, Norway, Peru, Portugal, Russia, Spain, Sweden, Turkey, United States (sea-going ships and inland waters), Uruguay. *Preliminary.* — Art 1. In the following rules, every steam-ship which is under sail, and not under steam, is to be considered a sailing ship; and every steam-ship which is under steam, whether under sail or not, is to be considered a ship under steam.

Rules concerning Lights. — Art 2. The lights mentioned in the following articles, numbered 3, 4, 5, 6, 7, 8, and 9, and no others, shall be carried in all weathers, from sunset to sunrise. — Art. 3. Sea-going steam-ships, when under weigh, shall carry: — *a. At the foremast-head*, a bright white light, so fixed as to show an uniform and unbroken light over an arc of the horizon of 20 points of the compass; so fixed as to throw the light 10 points on each side of the ship, viz., from right ahead to 2 points abaft the beam on either side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 5 miles: — *b. On the starboard side*, a green light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass; so fixed as to throw the light from right ahead to 2 points abaft the beam on the starboard side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles: — *c. On the port side*, a red light, so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass; so fixed as to throw the light from right ahead to two points abaft the beam on the port side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles. — *d.* The said green and red side-lights shall be fitted with inboard screens, projecting at least 3 feet forward from the light, so as to prevent these lights from being seen across the bow. — Art 4. Steam-ships, when towing other ships, shall carry 2 bright white mast-head lights vertically, in addition to their side lights, so as to distinguish them from other steam-ships. Each of these masthead lights shall be of the same construction and character as the mast-head lights which other steam-ships are required to carry. — Art. 5. Sailing ships under weigh, or being towed, shall carry the same lights as steam-ships under weigh, with the exception of the white mast-head lights, which they shall never carry. — Art 6. Whenever, as in the case of small vessels during bad weather, the green and red lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for instant exhibition; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side, nor the red light on the starboard side. — To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the color of the light they respectively contain, and shall be provided with suitable screens. — Art. 7. Ships, whether steam-ships or sailing ships, when at anchor in roadsteads or fairways, shall exhibit, where it can best be seen, but at a height not exceeding 20 feet above the hull, a white light, in a globular lantern of 8 inches in diameter, and so constructed as to show a clear, uniform, and unbroken light, visible all around the horizon, and at a distance of at least 1 mile. — Art. 8. Sailing pilot vessels shall not carry the lights required for other sailing vessels, but shall carry a white light at the mast-head, visible all round the horizon, and shall also exhibit a flare-up light every 15 minutes. — Art. 9. Open fishing boats, and other open boats, shall not be required to carry the side lights required for other vessels; but shall, if they do not carry such lights, carry a lantern having a green slide on the one side and a red slide on the other side; and on the approach of or to other vessels, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side. — Fishing vessels and open boats when at anchor, or attached to their nets and stationary, shall exhibit a bright white light. — Fishing vessels and open boats shall, however, not be prevented from using a flare-up in addition, if considered expedient.

Rules concerning Fog Signals. — Art. 10. Whenever there is fog, whether by day or night, the fog signals described below shall be carried and used, and shall be sounded at least every 5 minutes, viz.: — *a.* Steamships under weigh shall use a steam-whistle placed before the funnel, not less than 8 feet from the deck: — *b.* Sailing ships under weigh shall use a fog horn: — *c.* Steam-ships and sailing ships when not under weigh shall use a bell.

Steering and Sailing Rules. — Art. 11. If two sailing ships are meeting end on, or nearly end on, so as to involve risk of collision, the helms of both shall be put to port, so that each may pass on the port side of the other. — Art 12. When two sailing ships are crossing, so as to involve risk of collision, then, if they have the wind on different sides, the ship with the wind on the port side shall keep out of the way of the ship with the wind on the starboard side, except in the case in which the ship with the wind on the port side is close-hauled and the other ship free, in which case the latter ship shall keep out of the way; but if they have the wind on the same side, or if one of them has the wind aft, the ship which is to windward shall keep out of the way of the ship which is to leeward. — Art. 13. If two ships under steam are meeting end on, or nearly end on, so as to involve risk of collision the helms of both shall be put to port, so that each may pass on the port side of the other. — Art. 14. If two ships under steam are crossing, so as to involve risk of collision the ship which has the other on her own starboard side shall keep out of the way of the other. — Art. 15. If two ships, one of which is a sailing ship and the other a steam-ship, are proceeding in such directions as to involve risk of collision, the steam-ship shall keep out of the way of the sailing ship. — Art. 16. Every steam-ship, when approaching another ship, so as to involve risk of collision shall slacken her speed, or, if necessary, stop and reverse; and every steam-ship shall, when in a fog, go at a moderate speed. — Art. 17. Every vessel overtaking any other vessel shall keep out of the way of the said last-mentioned vessel. — Art. 18. Where by the above rules one of two ships is to keep out of the way, the other shall keep her course, subject to the qualifications contained in the following article. — Art. 19. In obeying and construing these rules, due regard must be had to all dangers of navigation, and due regard must also be had to any special circumstances which may exist in any particular case, rendering a departure from the above rules necessary in order to avoid immediate danger. — Art. 20. Nothing in these rules shall exonerate any ship, or the owner, or master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

It may, however, be proper to state that neither these nor any rules of the sort are to be regarded as inflexible, or to be followed at all hazards. The safety of the ship is the paramount consideration, and no master is justified in abiding by a rule when by doing so he plainly incurs danger. A. may be in his proper course; but if by pursuing it he will run a great risk of coming into collision with B., who is upon a wrong course, he is bound to alter his course so as to avoid a collision. The fact of one master being ignorant, careless, or in fault, is no reason why another should not use every means in his power to provide for the safety of his ship, and consequently of the lives and property entrusted to his care.

Collis, a package.

Collish, a shoemakers' tool to polish the edge of a sole.

Collodion, a colorless, viscid fluid, made by dissolving gun-cotton and the other varieties of pyroxylin, in a mixture of alcohol and ether. The quality of the *C.* differs according to the proportions of alcohol and ether and the nature of the pyroxylin it contains. *C.* in which there is a great excess of ether gives by its evaporation a very tough film; the film left by *C.* containing a large quantity of alcohol is soft and easily torn. but in hot climates the presence of an excess of alcohol is an advantage, as it prevents the rapid evaporation of the ether. Pyroxylin for the making of *C.* for photographic purposes is prepared by immersing cotton-wool ten minutes in a mixture of nitric and sulphuric acids at the temperature of 140 F. When tolerably strong acids at a low temperature are employed, the nitric acid being in by far the larger quantity, the pyroxylin made requires an amount of alcohol equal to only about $\frac{1}{8}$ or $\frac{1}{12}$ that of the ether in bulk. According to M. Miallie, the most explosive kinds of gun-cotton are not the best adapted for the preparation of *C.*; a pyroxylin very soluble in ether is in this process made from 2 parts by weight of carded cotton to 40 parts of nitre and 60 of concentrated sulphuric acid. Under the microscope the film produced by *C.* of good quality appears translucent and colorless, the cotton being perfectly dissolved; old *C.* that does not give good photographic impressions sufficiently quickly exhibits liquid globules of modified ether. The film from *C.* which is too alcoholic has the microscopic appearance of cellular tissue; and when water has been present the fibrillæ of the cotton become apparent as amorphous flocks. To preserve *C.*, it should be kept cool, and out of the action of the light. Iodized *C.* that has been discolored by the development of free iodine may be purified by the immersion in it of a strip of silver foil. For the iodizing of *C.*, ammonium, bromide and iodine and the iodides of calcium and cadmium are the agents employed. In surgery *C.* is used in its usual condition or combined with elastic and other substances, for the protection of inflamed surfaces, as are erysipelas and small-pox. Small balloons are manufactured from *C.* by coating the interior of glass globes with the liquid; the film when dry is removed from the glass by applying suction to the mouth of the vessel. *Imp.* duty (fluid *C.*), $1 per lb.

Collodion Process. See PHOTOGRAPHY.

Collop, a cutlet or small slice of meat. — A term for four or five sheep.

Colocynth, Bitter Apple, Bitter Cucumber, Bitter Gourd [Arab. *Hunzil;* Fr. *coloquinte;* Ger. *Coloquintt;* It. *coloquintida*], the fruit of an annual plant of the gourd kind (*cucumis colocynthis*), found in Turkey and Nubia. It is about the size of an orange, smooth and yellow, but is peeled and dried before being imported, when it becomes whitish, very light, dry, and spongy with a weak and disagreeable smell, and an intensely bitter nauseous taste. The medullary part, freed from the seeds, furnishes an extract used as a purgative. *Imp.* free.

Cologne Earth, a bituminous earth of a violet-brown hue, used in water-color painting.

Cologne Water. See EAU DE COLOGNE.

Colombia (United States of), a confederation in S. America, consisting of 9 states and comprising a considerable portion of the territory of the old Spanish colony of New Granada. It is bounded N. by the Caribbean Sea, E. by Venezuela, S. by Equador and Brazil, and W. by the Pacific. It thus extends from 12° 20′ N. to 2° 30′ S. lat., and from 65° 50′ to 83° 5′ W. lon. The area of the republic is estimated to embrace 504,773 sq. m., of which 330,756 sq. m. are N. of the equator, and the remainder S. of the equator. According to a rough estimation taken in 1871, the population at that date was 2,913, 343, divided as follows: —

STATES.	Area: sq. m.	Population.	Capital.	Pop. of capitals.
Antioqnia.......	22,316	365,974	Medellin........	30,000
Bolivar.........	21,345	247,100	Cartagena......	7,800
Boyaca.........	33,351	482,874	Tunja.........	8,000
Cauca..........	257,462	435,078	Popayan.......	16,000
Cundinamarca ..	79,810	409,602	Bogota........	50,000
Magdalena.. ...	24,440	85,255	Santa Marta ...	4,500
Panama........	31,571	220,542	Panama........	18,378
Santander......	16,409	425,427	Socorro.........	20,000
Tolima.........	18,069	230,891	Guamo.........	7,000

There are in *C.* about 120,000 uncivilized Indians. The rest of the pop. is about as follows: — 1,530,000 Spanish creoles and white crossbreeds, 450,000 crossbreeds in which the Indian blood is more distinctly present, 90,000 Africans, and 450,000 crossbreeds in which the Negro or Indian blood is plainly predominant. A constitution, bearing date May 8, 1863, vests the executive authority in a president elected for two years, while the legislative power rests with a Congress of two Houses called the Senate and the House of Representatives. The Senate, numbering 27 members, is composed of representatives of the nine states, each deputing three senators; the House of Representatives, numbering 66 members, is elected by universal suffrage, each state forming a constituency and returning one member for 50,000 inhabitants, and a second for every additional 20,000. Besides the central government thus created, each of the nine states has its own legislature and chief executive officer, the latter called Governor in all except Panama, which gives him the title of President. The President of *C.* has at his side a Vice-President, acting as chairman of the Senate, and his executive functions must be exercised through four ministers, or secretaries, responsible to Congress. The most important of the states of *C.*, that of Panama, comprises the whole isthmus of that name, known historically as the *Isthmus of Darien.* The extreme length of the state from E. to W. is about 360 geographical miles, but the sinuosities of the coast give about 400 m. on the Atlantic and 600 on the Pacific Ocean. Bogotá (or Santa Fe de Bogotá) capital of *C.*, is a fine city, situated in lat. 4° 6′ N., lon. 78° 30′ W., at the base of the mountains La Guadalupe and Montserrato. It has 3 endowed

colleges, a school of chemistry and mineralogy, a national academy, a public library, a botanical garden, a military school, a mint, &c. There are manuf. of soap, cloth, leather, and the precious metals. The surrounding country is exceedingly fertile, producing abundant crops of wheat and barley, and the leguminous plants cultivated in temperate countries.

C. possesses on the Atlantic a coast line of upwards of 1,000 m. richly furnished with bays and natural harbors. Proceeding westward from Calabozo Creek, in the Gulf of Maracaibo, the first inlet of real importance which we discover is the Bahia Honda, which is well protected from the strong winds of the E. and N., but is rendered unsuitable for the establishment of a port by its lack of drinkable water. Passing by the Bay of El Portete, we next reach the ports of *Riohacha* and *Dibulla*, of which the former is of considerable commercial importance

Fig. 93. — Palmita del Azufral.

as a centre of exportation, though it is greatly surpassed by that of *Santa Marta*, which is the next to break the coast-line. Santa Marta is situated at the side of the Cienega Lagoon, which stretches 25 m. from S. to N., with a breadth of 11 from E. to W., has communication with the lakes of Pajaral and Cuatro Bocas, and, though rather shallow, can be navigated by flat-bottomed steamboats. At the mouth of the Magdalena lies the port of *Barranquilla*, and a short distance to the W. that of *Sabanilla*, one of the most active along the whole coast. After these comes the splendid Bay of *Carthagena*, known for centuries to all navigators of the Carribbean; and still further to the W. the coast is broken by the port of *Zapote*, the Bay of Zispata, the Gulf of Morrosquillo, and finally by the noble Gulf of Darien, with the estuary of the Atrato and the ports *Turbo*, *Guacuba*, *Candelaria*, etc. Along the Isthmus are the Mandinga Creek; the Bay of Portobello, so famous in the history of Spanish America; the modern port of Colon, or *Aspinwall*, at the entrance of Navy Bay; and the now decadent port of *Chagres*. The coast-line of the Pacific is hardly so important as that of the Atlantic, except along the Isthmus, where it forms the great bay of *Panama*, with the subordinate inlets of Parita Bay on the W. and the Gulf of San Miguel on the E. Along the remainder of the line are *Cupica*, *San Francisco*, *Solano*, *Palmar* and *Charambira* (the last obstructed by a bar), the large Bay of Malaga, protected by the Isla de Palmas, with the harbors of *Guapi* and *Izcuandé*, the Bay of Pasa Caballos, the harbor of *Tumaco*, and in the island of *Gorgona* the fine harbor of Trinidad. The W. part of C. is one of the most mountainous districts in the world; its E. extension belongs to the great plains of the Orinoco and the Amazon. The two most important rivers are the Magdalena or Rio Grande and the Cauca, which both flow from S. to N. the entire length of the country, — the former occupying the valley between the Eastern and the Central Cordilleras, and the latter that between the Central and the Western. They unite about 130 m. before reaching the sea, but they so long maintain an independent course that neither can fairly be regarded as a mere tributary of the other. The *llanos* or plains of the Orinoco extend eastward from the slopes of the Cordillera de la Suma Paz. As far S. as the Vichada they form an almost complete level destitute of trees, and affording abundant pasturage, while further S. they are covered with forests, in which timber of gigantic proportions wait for the settler's axe. Besides several of the common species of palm trees, there are two remarkable species the *Ceroxylon andicola*, Palma de Cera, or Wax-palm, and the *Oreodoxa regia*, or Palmita del Azufral (Fig. 93), which in company with the oak, frequently clothe the Cordilleras to a height of 6000 or 8000 feet. They are both of extreme beauty, and the former shoots up to about 180 or 200 feet. From the Sierra Nevada and other districts are obtained logwood, Brazil wood, and fustic, and the *Myroxylon toluifera*, from which the balsam of Tolu is collected, grows luxuriantly on the banks of the Rio Negro. Excellent india-rubber is obtained from the *Castilloa elastica*, a lofty and luxuriant tree, which occurs in considerable abundance in Panama, Cauca, and other states. The quantity and quality of the material might be greatly increased and improved, as the collection is still in the hands of a very rude and careless class of men. Cinchona of six or seven different varieties is common throughout the country, — the elevation most favorable for its growth being between 7800 and 9000 feet above the sea. Of other medicinal plants there may be mentioned the aloe, the sarsaparilla, the albataque, and the vine of the cross. The cotton plant grows wild in many parts and yields an excellent fibre; indigo is indigenous; and an almost endless variety of fruits is found throughout the country. C. is distinctively a mineral country, its productions including gold, silver, platinum, copper, lead, iron, mercury, and antimony, limestone, potash, soda, magnesia, alum, and salt, coal, and asphalt, and emeralds, amethysts, and amber. Many of the most important deposits are as yet untouched, owing mainly to the defective state of internal communication, and even those that have been worked have proved much less remunerative from the same cause. Gold especially is very widely diffused; it was freely used by the natives before the arrival of Europeans, and formed a valuable source of revenue to the Spanish Government, who employed thousands of negroes and Indians in the task of collection. It is principally obtained from alluvial deposits; and in some districts there is hardly a stream that would not furnish its quota. Hydraulic appliances were introduced about 1870 in some of the workings; and a more systematic treatment is being gradually adopted. Antioquia is the most important gold-producing state in the confederation; total value of gold and silver exported from the capital in 1878 was $2,606,762; there were upwards of 80 lode mines at work in 1878, and 15,000 men and women are employed in the mining. The silver frequently occurs in very rich lodes; but, owing it would seem to various economical causes, many of the mining operations have been unsuccessful. The "Santa Anna" mines in Tolima, which were worked from 1826 to 1873, yielded during that period about $3,500,000 worth of ore, but ultimately proved a failure. The "Frias" silver mine, belonging to the Tolima Mining Co. of London, yielded in 1877 320 tons of ore valued at $500 per ton. The emerald mines, situated at Muzo, in the state of Bocayá, in the Central Cordillera, are remarkable as being the only known source of the genuine stone. The finest stones may be worked up to a value of $100 a carat; the worst sorts are only worth about $1.25. Coal is pretty generally distributed throughout the republic. Rock-salt is obtained in the table-lands of Bogotá, Tunja, and Pamplona, and forms an important Government monopoly. — *Climate.* Though C. is situated within the tropics, its great irregularity of surface and its extensive coast-lines develop a great variety of climatic conditions. A comparatively short journey transports the traveller from the sultry valley of the Magdalena, where the water grows tepid and the stones burning hot in the sun's rays, to the summits of a mountain where the snow lies cold from year to year. In the table lands and valleys of the E. and W. Cordilleras at a height of 800 to 9500 feet above sea level, there are two dry seasons and two rainy, the former commencing at the solstices and the latter at the equinoxes, while in the lowlands both of the Pacific and the Atlantic seaboard there is only one dry and one rainy of six months each. In the Gulf of Darien and the Isthmus of Panama there is no such distinction, and rain occurs in any part of the year. The greatest mean temperature in the country is about 86° Fahr., and the lowest in the inhabited parts of the Cordilleras is about 44°. At Honda, which is about 1000 feet above sea-level, the daily range of the thermometer is only from 8° to 12°, and the annual not more than 20°. "The hottest place," says Mosquera, to whom we are largely indebted, "which I have found in New Granada, is the port of Ocaña, where I have on several occasions seen the thermometer in the shade at 104° Fahr." In the *llanos* of the Orinoco the mean annual temperature is about 80° Fahr.,

while in the forest district to the south the average is about 8° higher. In the latter the rain is distributed throughout the year, while in the former the seasons are distinctly marked, and from November till April the rains fall in torrents accompanied with dreadful thunder-storms. — *Agriculture* and *Commerce.* Agriculture holds the first place among the industries of *C.*; but the methods employed are still of a very rude description. Maize, wheat, and other cereals are cultivated on the elevated plains; rice, cotton, tobacco, sugar, coffee, cocoa, yams, arracacha, and bananas in the coast region. Tobacco is especially successful in Ambalema, Carmen, Palmira, Jiron, and Morales, and it forms an important export. In the plains of the Orinoco and the undulating savannas of Panamá the breeding of cattle and horses is largely carried on by the creole inhabitants, and several of the Indian tribes are also in possession of valuable herds. Beyond such common (almost domestic) trades as hand-weaving, dyeing, tanning, and basket-making, there is almost no manufacturing industry in the country, though the basis for future development has been laid by the establishment in Bogotá of glass-works, distilleries, a cigar-factory, and a sulphuric acid factory. — *Foreign Commerce.* One product of the domestic industry alone finds its place in the list of exports, — namely, straw hats, usually known as jipijapa or Panamá hats. The raw produce, however, is largely exported; the principal articles being cinchona bark, indigo, coffee, cotton, tobacco, silver ore, hides; and the minor items, — ivory-nuts, ipecacuanha, and balsam of Tolu. For the year 1878, the total imports amounted to $9,737,686 and the exports to $15.696,574. Far more important than the direct commerce is the transit trade, passing through the two ports of Panamá and of Aspinwall, which, united by railway, connect the Atlantic with the Pacific Ocean. The transit trade across the Isthmus of Panamá is of the estimated value of $85,000,000 per annum, about two-thirds representing the trade from the Pacific to the Atlantic, and one-third that in the opposite direction. The foreign trade of *C.* is mainly with the U. States and England. The imports of British produce into *C.* have been gradually diminishing from $15,751,685 in 1872 to $3,616,815 in 1878; while the U. States, which are now learning to manufacture articles with reference to the wants of particular localities, and with all the cheapness and durability of European products, have increased during the same period their trade with *C.* in a very large proportion.

For the year 1878 the trade of *C.* with the U. States was as follows: *Imports*, $4,559,226, consisting chiefly of beer, $11,090; books, $29,568; wheat flour, $220,175; candles, $16,587; carriages, $26,881; cars (railroad), $35,747; clocks, $11,569; coal, $65,073; cordage, etc., $20,734; cotton (manufactured), $545.017; drugs, chemicals, etc., $330,434; fancy articles, $12,687; canned fruits, $13,323; glass and glassware, $79,509; gold coin, $175,975; iron (machinery, nails, etc.), $547,868; edge-tools, $171,443; fire-arms, $177,702; boots and shoes, $28,693; matches, $40,012; piano-fortes, $14,771; petroleum, $73,894; cartridges, $64,141; paintings, $21,035; paper and stationery, $71,851; perfumery, $12,124; plated ware, $12,392; salted beef, $19,711; butter, $35,903; cured fish, $16,644; lard, $534,471; preserved meats, $31,751; pork, $40,512; scales, $12,373; sewing machines, $93.800; soap (perfumed), $11.787; (others) $101,610; spirits, $34,599; sugar (refined), $126,633; tobacco, $111,587; wood (board, deals, etc.), $51,684; household furniture, $97,059. *Exports*, $6,504,099, chiefly consisting of cinchona bark, $900,370; cocoa, $116,972; cochineal, $144,934; coffee, $1,022,216; gold and silver (bullion and coin), $489.497; gums, $79,782; hides and skins, $1,401,347; india-rubber, $1,006,521; indigo, $303,868: nuts, $135,151; straw hats, etc., $20,034, sugar (brown), $66,737.

Finances, etc. The national income for 1878 was 4,838,800 pesos. The taxes are very light, — by far the greater part of the revenue accruing from the custom-houses established at Buenaventura, Carlosama, Cartagena, Cucuta, Rio Hacha, Sabanilla, Santa Marta, Jumaco, and Turbo. The customs would yield a still greater return were it not for smuggling, which prevails largely, especially at Cartagena. The tariff hitherto in use divides articles into classes, which pay so much per kilogramme; and thus the burden of the duty falls most on inferior goods. The postal service is still in a very backward state, and the charges are very high; but this cannot be otherwise till the road system of the country has been developed. Rapid progress, however, is being made by several of the states in this preliminary undertaking. In Jan. 1879, there were upwards of 1,500 m. of telegraph, the principal lines stretching from Honda to Bogotá, and from Ambalema to Manizales. In 1878, the total number of telegraphic messages amounted to 97,325. In the less populous districts the maintenance of the lines is very costly, as not only are the wires stolen by thieves, but they are frequently damaged by the monkeys, who use them for gymnastic purposes. The only two railways actually in operation are the Panamá line (46 m.), and the line between Sabanilla and Baranquilla (17 m.): but great efforts are being made, both by the central government and by the separate states, to construct lines throughout the country, and contracts have already been made for some of the most important. The public debt amounted, in 1878, to 53,085,644 pesos.

Of the ports above enumerated, the principal are,

Aspinwall, or *Colon*, a free port of the N. coast of Panamá, built on the well-wooded coral island of Manzanilla, in lat. 9° 22′ 53″ N., lon. 79° 52′ 58″ W. In spite of the unhealthiness of its situation, — now, indeed, largely diminished, — and the dangerous winds from the N. to which it is at some seasons exposed, it has quite superseded the neighboring port of *Chagres*, and become the centre of a considerable local trade. The banana, especially, is cultivated in the neighborhood, and largely exported to New York. A railway, constructed by a joint-stock Co. of New York, and completed in 1864, connects Aspinwall with Panamá. Trains take about 3 hours in passing from sea to sea. Aspinwall is the principal commercial entrepôt between the Eastern States and California, and connects with New York (distance 1,980 m.) by the steamers of the Pacific Mail Co., leaving New York on the 10th, 20th, and 30th of each month.

Cartagena or *Carthagena* is situated in lat. 10° 25′ 48″ N. lon. 75° 34′ W., on a low sandy island, which, with the island S. of it, Terra Bomba, forms the harbor of Cartagena. The mean temperature of *C.* is about 83° F. In the summer the heat is excessive, and yellow fever often commits great ravages. The harbor affords complete security to ships in all weathers, and great facilities for loading and unloading. It is divided into 3 sections, Boca Grande and Pascaballos, and the Caldera, which have a depth of 15 fathoms; and Boca Chica, which is deeper. The narrowness of the entrance of Boca Chica, the shallowness of its mouth, and the irregularity of the tides, render a pilot necessary for ships passing through it. The roadstead for large vessels is about 3 m. from the city. A chain of salt lakes, which open into the bay of Cartagena to the S.W., and extend towards the river Magdalena, was taken advantage of by the Spaniards in former times for the construction of a canal. During the War of Independence the old channel became choked up; it was reopened in 1846, after which the flooding of the valley rendered the channel once more unnavigable, except for barges of light draught. On account of the closing of the Digue, the rival port of *Baranquilla* has been created, and a great amount of commerce has been transferred to *Santa Martha.* The rapidly-increasing requirements of trade in *C.*, and the great superiority of Carthagena as a shipping depot, cannot fail, however, of securing before long the reopening of the route by the Digue. Pop. 7,800.

PANAMÁ, on the Pacific, in lat. 8° 56′ N., lon. 79° 13′ 2″ W., stands on a rocky peninsula, projecting into the Bay of Panamá, and has an imposing aspect from the sea. Its roadstead is one of the finest in the world. There are a number of islands a short distance from the main land, which afford secure anchorage for ships, and from which supplies of provisions, including excellent water, may easily be obtained. The tides daily rise and fall from 20 to 27 feet, so that it is peculiarly well fitted for the repair and building of ships. Great numbers of steamers are employed in the trade between Panamá and San Francisco. Pop. 20,000.

Money. The *peso*, or dollar, of 10 reals = 0.93.5. The currency is almost entirely imported, the gold coins consisting of doubloons of Spain, equal to 16 dollars, of British sovereigns, condors and half condors, and the silver pesos, reals, half reals, and quarter reals. There are no home-struck copper coins. In foreign mercantile transactions, the French five-franc piece, equal to one peso, is most generally in use.

Weights and Measures. The metric system of France was introduced in 1857, and the only weights and measures recognized by the Government are the French. In custom-house business the *kilogramme*, equal to 2,205 lbs. avoirdupois, is the standard. In ordinary commerce, the *arroba*, of 25 lbs., the *quintal*, of 100 lbs., and the *carga*, of 250 lbs., are generally used. The Colombian libra is equal to 1.102 lbs. avoirdupois. As regards measures of length, the English *yard* is mostly employed, but in liquid measure the French *litre* is the legal standard.

Colombier, a large-sized paper, 23½ inches by 34.

Colombine [Fr.], pigeons' dung, or the dung of fowls.

Colombo. See CEYLON.

Colombo-Root. See CALUMBA-ROOT.

Colonial Agent, a merchant who transacts business connected with the colonies, or acts as agent for colonists.

Colonist, a native of, or resident in, a colony or dependency.

Colony, a term commonly used to express an outlying part of the population of the mother-country, or an outlying territory belonging to it, either in conjunction, or any of the two by itself. In both ancient and modern times colonization has proceeded from the same causes, namely, commercial enterprise, political commotion, the desire

of conquest, or the natural overflowing of population. The spirit of colonial enterprise, dormant in the Middle Ages, was revived in the 13th century by the Italian republics, Genoa, Pisa, and Venice, which formed settlements in various parts of the Mediterranean and Levant. The modern European C., however, owe their origin to the ambition of the maritime states to participate in the Indian commerce formerly conducted by way of the Red Sea, and monopolized by the Venetians. The discovery of the compass prompted navigators to attempt this by new channels. The Portuguese ascertained the eastern passage in 1497, when the Cape was doubled by Vasco de Gama; the Spaniards attempted a westerly course which led to the discovery, by Columbus, of the West Indies in 1492, and of S. America in 1498; while the English despatched Cabot by the N.W., a route which led him to Newfoundland and N. America, in 1497. In S. America, Columbus's discoveries were followed by the conquest of Mexico in 1519 by Cortez, and of Peru by Pizarro and others in 1531. Brazil was settled by the Portuguese in 1500. The West Indian Islands, notwithstanding the papal grant in favor of Spain, were occupied by various nations; Hispaniola or Hayti in 1496; Jamaica, about 1510; Cuba, 1511; Porto Rico, 1514; Barbadoes, 1605; and the others at later periods. The progress of colonization was much slower in N. America; Virginia was taken possession of by Raleigh in 1583, but soon after abandoned; and the first permanent English settlement, which was at Jamestown in the same State, was not formed until 1607. The colonization of N. America afterwards proceeded rapidly, particularly during the disturbances in England which attended and followed the dethronement of Charles I.; the cavaliers emigrating to Virginia, the Puritans to New England, and the Quakers to Pennsylvania. The English, after repeated failures, at length reached the Indian continent in 1612. In 1776, the attempt of Great Britain to tax the American colonists for the purposes of the general government led to the political separation of the U. States from the mother-country; and in 1810, revolutionary movements occurred in S. America which resulted in the emancipation of the Spanish colonies on that continent.

The existing C. and dependencies of *Great Britain* cover about one sixth of the land surface of the globe, and nearly the same proportion of its population. They possess: — In *Europe;* Gibraltar, Malta, Gozo, Heligoland, and Cyprus: *N. America;* Dominion of Canada and Newfoundland, together with the Falkland group off S. America: *West Indies;* Jamaica; the Windward Islands, Barbadoes, St. Vincent, Granada, Tobago, St. Lucia, and Trinidad; the Leeward Islands, Antigua, St. Christopher's, Montserrat, Nevis, Anguilla, Dominica, and Virgin Isles; Bahama Islands; Bermuda Islands; Demerara, Berbice, and Essequibo in Guiana; and the settlement of Honduras in Central America: *Africa;* Cape Colony; settlements in Guinea and Senegambia, including Bathurst, Sierra Leone, and Cape Coast Castle; the islands of Fernando Po, St. Helena, Ascension, and Tristan d'Acunha; the Mauritius, and other small islands in the Madagascar Archipelago: *Australasia;* Australia; Tasmania; and New Zealand: *Oceania;* Fiji: *Asia;* India; Ceylon; Aden and Perim; Straits settlements; Labuan (Borneo); and Hong Kong (China).

The foreign possessions of *Spain* at present consist of Cuba, Porto Rico, the Philippines, the Canaries, and settlements in Morocco. *Portugal* has the Madeiras and the Cape de Verde Islands; Angola, Benguela, Loango, and Mozambique in Africa; Goa in India; Macao in China; and a settlement in the island of Timor: *France* has the West India Islands Guadaloupe, Martinique, Marie-Galante, and Deseada; Cayenne in Guiana; the small islands of St. Pierre and Miguelon in the vicinity of the Newfoundland fishing-ground; Algiers, Senegal, and Goree in Africa; the isle of Bourbon; St. Marie in Madagascar; Pondicherry, Chandernagore, and Cochin-China in Asia; New Caledonia and Loyalty Islands; and Marquesas in Oceania. *Holland* possesses Java, the Moluccas, and settlements in Sumatra, Celebes, Borneo, Banda, and other eastern islands; the West India Islands Curaçao, St. Eustatius, Saba, and part of St. Martin; and Dutch Guiana: *Denmark* has Iceland, settlements in Greenland, the West India Islands St. Croix, St. Thomas, and St. John; Christiansburg and other possessions in Guinea; and Tranquebar and Serampore in India: *Sweden* has the West India Island of St. Bartholomew. The *U. States* have no C. The vast unoccupied territories at the West relieve her citizens and the immigrants who join them from seeking scope for their enterprise beyond the recognized limits of the Republic; but the method according to which the national government provides for the continuous westward advance of new settlements is essentially a system of colonization. The newly-occupied lands are governed as a *territory* by the Federal Government, till the population reaches a fixed limit high enough to justify a demand to be admitted to the Union on an equal footing with the other States. The *American Colonization Society* has made an interesting philanthropic experiment for the establishment of negro freedom in Africa; the result is the existing independent republic of Liberia.

Colophony. See Resin.

Color, commercially, any substance employed as paint or dye and for other coloring purposes in the arts. C. used by artists and house-painters are called *pigments;* those employed for staining textile fabrics are called *dyes*, and the substances used to produce them are called *dye-stuffs.* In the dry-goods trade the white and the black fabrics are not classed as goods in colors. The makers of C. take the whole range of the animal, vegetable, and mineral kingdoms in their search for materials; and the substances so used may be counted literally by hundreds. For notices of dyes, pigments, etc., refer to the principal C., and to the particular names of the coloring substances.

White light from the sun is of a compound nature, and may be decomposed into rays of different colors; Newton distinguished seven *primitive C.*, namely, violet, indigo, blue, green, yellow, orange, and red. Other scientists are disposed to think that four of these C. are really compound, and that three, namely, blue, yellow, and red, alone deserve the name of primitive. The C. of natural objects are supposed to result from the power possessed by their surfaces of absorbing some of the colored rays of light, while they reflect or transmit, as the case may be, the remainder of the rays. Thus, an object appears red because it absorbs or causes to disappear the yellow and blue rays composing the white light by which it is illuminated. Black and white are not C., strictly speaking. A body is said to be black when it absorbs or quenches a large proportion of all the rays of white light falling upon it. A body is said to be white when it receives the white light, and reflects all the rays with moderate strength. Gray may be regarded as a luminous black or dark white. The names given to C. are far from being satisfactory, for although many thousand shades may be distinguished by a practised eye, it is a question whether there are fifty names which would convey the same idea of shade to any ten colorists in the world. The names taken from natural colored objects, as indigo, violet, orange, lilac, amber, emerald, etc., are the least objectionable. — C. are said to be *complementary* or *accidental* to each other which, by blending together,

produce the perception of whiteness. All *C.* are produced by the admixture of red, yellow, and blue light, in certain proportions; and by intercepting either one or more of these colored rays in a beam of light, those which meet the eye will consist of the remaining colored rays of the spectrum. Thus, by intercepting the red rays in a beam of white light, the remaining yellow and blue rays will produce a green *C.*; by intercepting the blue rays, the remaining yellow and red will give an orange; and so on of other cases; so that red and green, blue and orange, are *complementary C.* If we look for some time, with one eye, on a bright-colored object, as a wafer placed on a piece of paper, and subsequently turn the same eye to another part of the paper, a similarly shaped spot or mark will be seen, but the *C.* will vary, though it will be always the same under like circumstances. Thus, if the original spot or wafer be of a red *C.*, the imaginary one will be green; if black, it will be white; the imaginary *C.* being always complementary of that first gazed upon. The *C.* so perceived is often called an *accidental C.*, to distinguish it from the real *C.* It is a general maxim in design that "*C.* look brightest when near their complementary colors."

Artists' C. or *Cake C.* are made by grinding, by means of a glass muller and a slab, the respective pigments previously reduced to powder, into a smooth paste with equal parts of isinglass size, and thin gum-water. The paste is then compressed into squares as tightly as possible, and dried with a very gentle heat. Old crumbling cake *C.* should be powdered very finely in a biscuit-ware mortar, sifted through fine muslin, and ground up as above, the gum-water being omitted The powders rubbed up with honey to the consistence of cream constitute moist *C.*

Colorado, a W. State of the U. States, bounded N. by Wyoming and Nebraska; E. by Nebraska and Kansas; S. by the Indian Territory and New Mexico; and W. by Utah. This State lies between lat. 37° and 41° N., lon. 102° and 109° W. Breadth N. to S. about 280 m., length E. to W. about 380. Area 103,475 sq. m., or 67,723,250 acres. Population, 150,000. *C.* is traversed from N. to S. by the great continental chain of the Rocky Mountains, and may be divided into a mountain district, a hill district, and a plain district. The principal range of these mountains bears the name of Sawatch Range. It consists of a solid mass of granite, has an average elevation of 13,500 feet, a mean breadth of 15 to 20 m., and up to about lat. 40° N. forms the dividing line between the Atlantic and the Pacific versants. One of the most remarkable features of the orography of *C.* is the unusual development of its upland valleys, or *parks*, to use the term that has become distinctly their own. The four most extensive are known respectively as the North, the Middle, the South, and the San Luis; the last is by far the finest of the four. They stretch almost in a line from the S. to the N. boundary of the State, just on the W. side of the Front Range, and occupy an average breadth of 50 m. The San Luis Park is, as it were, an "immense elliptical bowl," with an area of 9,400 sq. m., bounded E. by the West Mountains and the Sangre de Cristo range, and W. by the Sierra de San Juan, which is part of the great Sierra Miembres. Its surface is nearly as flat as a lake. The centre of the N. part, which bears the distinctive title of the Rincon, is occupied by a considerable sheet of water, fed by 19 mountain streams, and accustomed in the winter to overflow a large stretch of the neighboring savanna. The river which gives its name to the State belongs to it only by some of its most important tributaries, of which it is sufficient to mention the Bear River, and the Gunnison and Grand River, which unite before they pass into the Territory of Utah. Of the rivers of the Atlantic versant, the most important are the South Plate, the Arkansas, and the Rio Grande del Norte. *C.* is pre-eminently a mineral district, and to this fact it owes its colonization. It possesses extensive deposits of gold and silver ore, and between the years 1859 and 1878 it furnished to the U. States Mint $29,984,158.59 worth of the former metal and $15,846,879.20 of the latter. Iron is pretty widely diffused, and zinc and copper occur in many of the mines. Coal is also found extensively on both sides of the main range of mountains; the area occupied by the Tertiary deposits being no less than 7,200 sq. m. The mining districts are five in number, and are distinguished as the district of the northern mines, the mines of the eastern base, the Conejos County mines, the southern mines, and the mines of Summit County. At Murphy's mine, about twelve miles from Denver, the stratum is about 16 feet thick, and the percentage of fixed carbon is found to be 55.31. The total yield of these mines for the year 1878 was 367,000 tons. Leadville, a new city only two years old, with a population of 10,000, situated 10,200 feet above the sea-level, near the head-waters of the Arkansas River, owes its foundation, and its development into a permanent mining region, to the discovery there made of rich silver-mines, whose product for the year 1879 is estimated at $10,000,000. The *climate* of *C.* is remarkable for its regularity and salubrity. During the day the thermometer not unfrequently rises to 90° in summer, but the nights are always cool and dewless. In winter the weather is generally mild, — the lowest thermometric marking being only 7° below zero, in Middle Park 15°, and in Denver 13°. Snow often lies deep in the higher inhabited districts, but in the lowlands it is never more than 10 or 12 inches, and it disappears again almost immediately. Between July and Oct. there is very little rain, day after day bringing a bright and cloudless sky. "An air more delicious to breathe," says the late Bayard Taylor, "cannot anywhere be found; it is neither too sedative nor too exciting, but has that pure, sweet, flexible quality which seems to support all one's happiest and healthiest moods." The only flaw in the climate of *C.* is its violent storms of wind, and in some parts of the country heavy falls of hail. Among the hygienic advantages of which *C.* can boast, the mineral wells hold an important place. They occur in various parts of the country, and belong to different classes. Chalybeate waters are found at Manitou, Carlisle, and Red Creek; soda springs at Manitou, Trinidad, and Cañon City; sulphur springs at Fairplay, on the Navajo River, and at Idaho Springs, and thermal springs, partly sulphur and partly soda, exist at Pagosa, in the Middle Park, in Seguache County, at Wagon-Wheel Gap, and at Del Norte. Manitou is already becoming a fashionable watering-place; the fountains and the surrounding land were purchased by a company in 1870; and in 1878 there were several large hotels and numerous private residences erected round the spot. In the lowland districts water for drinking is very scarce; but supplies can frequently be obtained by the sinking of artesian wells. The mountains of *C.* were, till a comparatively recent date, richly clothed with forest; but owing partly to natural causes, and still more to the lavish consumption and reckless destruction of the early settlers, the quantity of growing timber in the State is exceedingly small, and before long, if restorative measures are not adopted, the Colorado demand for wood will require to be

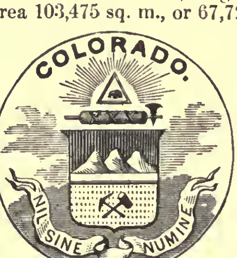


Fig. 94. — Seal of Colorado.

supplied from without. The principal trees, after the pine, are the so-called hemlock and cedar, the cotton-wood, and the aspen (or *Populus tremuloides*). The minor flora of the country is exceedingly rich; and especially in the plain region the abundance of flowers is amazing. Wherever irrigation can be obtained the soil of eastern C. is well fitted for agriculture. Wheat, oats, and barley afford heavy crops; potatoes succeed except in the extreme S., and owing to the dryness of the atmosphere are easily kept; and almost all the garden products of the same latitude in the East can be satisfactorily cultivated. The wheat affords a very white dry flour, and competes with the finest in the markets of the world. The yield often reaches 40 to 50 bushels per acre, and in exceptional cases considerably exceeds this amount. In the higher districts — the parks and the mountain-valleys — a greater proportion of ground is devoted to pasture, either of sheep or cattle. The native grasses are of excellent quality as fodder; and during the winter the natural hay that has withered where it grew is preferred by the cattle to the best that can be furnished by the labors of the husbandman. In certain districts the pastoral departments of husbandry have had to be abandoned, owing to the presence of poisonous plants, the most important of which seems to be *Oxytropis Lamberti*; but these districts are of very limited extent. The cost of pasturing is merely nominal, as the cattle can be driven over extensive districts, under the charge of Mexican or Indian herdsmen. Wool can be produced for ten cents per lb., and a four-year-old steer for ten dollars. The chief plague of the agriculturist is the grasshopper. This insect is usually hatched in the month of June, when the cereals are well advanced; but occasionally in dryer and warmer seasons it appears as early as April and does great damage to the young crops. Another insect, the *Doryphora decemlineata*, popularly known as the C. beetle, has become famous for its attacks on the potato, not only in this State but as far east as the Atlantic States. — *Denver*, the capital and principal commercial town of the State, is situate on the S. Plate River, about 680 m. W. of the Mississippi River, and 15 m. E. of the Rocky Mountains; lat. 39° 45′ N., lon. 104° 50′ W. This fine city has 4 National Banks, and its commercial and manufacturing interests are rapidly progressing. Six railroads are diverging from D., the Denver and South Park and Pacific R.R. connecting it with Leadville. Pop. about 35,000. Pop. of State, 150,000.

Color-Box, a box with cakes of water-colors.

Color-Printing consists not merely in printing with colored ink or paint instead of black, but in combining many different colors on the same sheet of paper. If printed in *one* color, it might certainly be designated color-printing; but the technical meaning of the term is usually *polychrome*, or many-colored. There must be a distinct plate, form of type, or stone (according to the kind of printing), for each color; and they must all be so *registered*, or adjusted, that each will come exactly in its proper place. The preparation of the plate, block, or stone is a matter of nicety, in order that the color should touch that particular one only which is to give the desired tint. Many ornamental productions are printed in gold as well as colors. In this case the plate is wetted with a kind of Japan gold-size, a layer of which is thence transferred upon the paper; leaf gold is placed upon the gold-size, to which it adheres; and a bit of cotton-wool suffices to rub off the surplus gold from those parts of the paper which had not been wetted by the gold-size. Inferior articles, such as the labels attached to spun and woven cottons, are printed with bronze-powder instead of with leaf-gold.

Colored Fires, compositions used in pyrotechny for making *stars*, *lights*, *lances*, and other ornamental fire-works.

Colored Glass, stained glass for windows; also Bohemian or fancy glass articles.

Colored Goods, cotton, linen, or worsted fabrics, printed, stained, or dyed. In commerce, this term does not apply to black goods; but in revenue laws' phraseology it includes all goods that are not white.

Colporteur, the French term for a news-hawker, a pedler or itinerant vender or distributor of wares.

Colrake, a shovel used to stir lead ore when it is being washed.

Colter or **Culter**, the sharp iron cutting-knife of a plough, fixed over the share, to prevent, or remove, the accumulation of grass or rubbish. In fen lands it is in the form of a wheel.

Colt's Foot, a name for the *Tussilago farfara*, a wild herb, the leaves of which are emollient, demulcent, and tonic. They were formerly smoked in troublesome coughs, but are now used in decoction. *Imp.* free.

Columba-Root. See CALUMBA-ROOT.

Columbia. See SOUTH CAROLINA.

Columbia, a fire Insurance Co. of New York City, organized in 1853. *Statement* on Jan. 1, 1879: — Capital stock, \$300,000; net surplus, \$10,-702; total cap. and surplus, \$310,702. Risks in force, \$8,241,858; premiums, \$72,168. Premiums received since the organization of the Co., \$3,048,-798; losses paid, \$1,834,385. Cash dividends paid to stockholders, \$455,000.

Columbia (British). See CANADA.

Columbia (District of). See WASHINGTON.

Columbo or **Colombo**. See CEYLON.

Columbus. See OHIO.

Column Rules, thin pieces of brass used in printing-offices to separate longitudinally the columns of type.

Colza Oil, a valuable oil manufactured to a large extent in Europe, by expression of the unctuous seeds of the common rape (*Brassica napus sativa*), and the navew (*B. campestris*). It is much used for lubricating machinery, for burning in the carcel, moderator, and other similar lamps, and in the French lighthouses it is preferred to any other oil in use, on account of its greater brilliancy and steadier flame, with less charring of the wick, as well as for its greater cheapness. *Imp.* duty, 20 per cent.

Comb [Fr. *peigne*; Ger. *Kamm*; It. *pettine*; Port. *pente*; Sp. *peine*], a toothed instrument for cleaning and adjusting the hair, made from a considerable variety of materials, the most common being the horns and hoofs of cattle, tortoise-shell, ivory, box-wood, and vulcanite, or hardened india-rubber. Metallic C. are used for carding or cleaning wool, cotton, and other fibres, and for rubbing down the coat of horses. — A steel tooth with teeth corresponding to those of a screw, used for chasing screws on work which is rotated in a lathe. — The projection on the top of the hammer of a gun-lock. — The notched scale of a wire-micrometer. — In hat-making, the former on which a *fleece* or fibre is taken up and hardened into a *bat*. — The wax-cell of bees.

Hair C. manuf. Of all the materials from which C. are made, horn is by far the most extensively employed, and the working of that substance illustrates all the peculiarities of the craft. The industry is one still extensively prosecuted on a small scale, with all the disadvantages of manual labor and watchful and tedious processes; but in several large factories very ingenious labor and material-saving machinery is brought

into operation. When the horn is brought to the factory, it is first assorted into sizes, preparatory to being cut up into pieces. From an ordinary horn two cross-sections are taken for *C*-making, called, first, the head or root cut, and, second, the screw or tip cut. The solid tips remaining are disposed of either for button-making or for being formed into knife and other handles. Other scraps and cuttings are of great value to makers of prussiate of potash for artificial manure. The sections to be used for *C.* are taken to the opening department, where they are wetted in water and heated over an open fire till the horny substance becomes quite soft. The head cut is slit longitudinally once, or, if it is a large horn, it may be slit into two. The screw cut is so termed on account of the peculiar spiral direction in which it is slit, the cut being so directed that the piece when opened out may form an oblong rectangular plate, with as little waste of horn as practicable. After slitting, the cuts are opened out between tongs, and inserted between screw-plates, where they are pressed quite flat. Plates which are intended for staining in imitation of tortoise-shell are at this stage inserted in strong iron frames between heated and oiled iron plates, in which they are submitted for some time to enormous pressure. After this pressure the plates are found to have a translucent appearance, and a uniform greenish hue. The pressure, however, operates injuriously on the fibre or grain of the horn, rendering it liable to split. When, therefore, the horn is of good natural color, it is preferable to finish it in that condition. The prepared plates of horn are laid aside to dry in a room where a high temperature is maintained by steam-pipes. Subsequently they are squared and trimmed on circular-saw benches, and assorted into sizes suitable for the various kinds of *C.* manufactured. — In the manufacture of ordinary dressing-*C.*, two distinct processes of tooth-cutting are followed. The first method, which is applied to all fine combs, consists of cutting out the teeth by means of circular saws; and this is the only process applicable to the preparation of small-toothed *C.*, and all *C.* made of ivory and box-wood. Saw-cutting is, moreover, the only process formerly adopted; but instead of a circular saw, the *C.*-maker used a gauged hand-saw, called a *stadda* or *steady*. The saws now employed are of small diameter, and, according to the work they have to perform, they are fine-toothed and thin, some of them being constructed to cut from 70 to 80 teeth per lineal inch. The saws are mounted on a spindle, which revolves with great rapidity, and the plate or plates of horn to be toothed are clamped up in a holder, which, by a cam motion, is alternately raised and depressed, bringing the horn each time against the saw, which cuts out one tooth to its full depth. After each cut, an automatic arrangement moves the horn forward the breadth of a tooth, the gearing being so mounted that the teeth may be cut fine or coarse at pleasure. The second method of cutting the teeth is known as twinning, from the fact that a pair of combs are cut out of a single plate. The process of twinning consists in so cutting a plate of horn that the whole material is utilized, what is removed to form the teeth of one *C.* being exactly sufficient for the teeth of a corresponding opposite *C.* When the cutting of twinned *C.* is complete, the plate presents the appearance of a pair of *C.* with their teeth exactly inosculating or dovetailing into each other. The twinning-machine, by which this is accomplished, is a complex and beautiful piece of mechanism. The plates of horn to be twinned are softened by heat, and secured in a bed-plate, which travels under a pair of cutting-chisels, fast or slow, as the teeth are to be cut coarse or fine. The chisels, having cutting edges equal to the length of the teeth to be formed, descend alternately, and cut through the plate; but as their cutting edges are at a small angle in relation to each other, the cuts are wedge-formed or tapering, and thus the pointed ends of one comb are taken out of the roots or head of another. With the aid of this apparatus, a man and boy can cut more than 2000 *C.* per day, while an old-fashioned *C.*-maker, working with his hand-saw, can only cut from 2 to 3 dozen *C.* daily, and that with almost double the material required in the twinning process. After the *C.* are formed either by circle saw or by twinning, they are next thinned or tapered to their outer edges on grindstones. They then pass to the *grailing* department, where, by means of special forms of files or rasps, known as grails and topers, the individual teeth are rounded or bevelled, tapered, and smoothed. If the *C.* are to be finished in their natural colors, they are then smoothed with sand-paper, buffed on leather wheels, and polished on wheels built up of disks of soft calico. If, as is frequently the case, the *C.* are to be finished as imitation tortoise-shell, they are, in the translucent state before alluded to, treated with dilute nitric acid, which communicates a light yellow tinge like the ground-color of tortoise-shell. The deep, semi-opaque orange spotting is next produced by dropping over the surface spots of a composition containing caustic soda, litharge, and dragon's blood. After some time this composition is washed off, and the parts to which it was applied are found to be a little swollen up, and stained a deep orange tinge. The *C.* are then polished as above stated. The elaborate pierced patterns of ornamental back *C.* are cut out by small ribbon saws; and the work is generally finished by hand-carving with proper tools. Plainer and less artistic work is done by embossing in heated dies, and ordinary pierced work is also produced by cutting dies. Formerly, the wide-set teeth of back *C.* were frequently stamped out. In order to economize tortoise-shell, and to obtain large and thick *C.* out of the comparatively small and thin plates in which that substance usually occurs, a process of cementing or soldering is resorted to. The joining of two plates of tortoise-shell is very perfectly accomplished by first carefully scraping and cleaning the surfaces to be united. They are then applied to each other, heated, and strongly pressed between pincers, — this being sufficient to cause a perfect amalgamation of the two surfaces. After cementation, tortoise-shell is treated in every respect as a piece of fine white or buffalo horn.

Hair *C.* are not manuf. on a large scale in the U. States; they are generally imported from Germany, France, and England. *Imp.* duty for all kinds, 35 per cent.

Comb-Brouch, the tooth of a wool-comb.

Combed Wool. See COMBING.

Combing-Wool. See WOOL.

Combination, in chemistry, the union of two or more substances in such a manner as to form a new compound. — In trade, an illegal union of workmen on strike to prevent others taking the places they have quitted. See STRIKE.

Combing, an operation in the worsted or long-wool manufacture. The operation of straightening and disentangling wool; corresponding in purpose with *carding* of short wool. — In hand-*C.*, the work is done between two combs, one held stationary and the other drawn over it, to comb out the lock of wool placed between them. The combs have a number of steel spikes fixed into a back, and are occasionally heated in a *comb-pot.* The short fibres which are combed out are called *noyls.* — In machine-*C.*, the locks are fastened to two toothed cylinders, which revolve in apposition to each other, and are heated by steam within. The teeth of one cylinder comb the fibres on the other one. — *Knight.*

Combustible, any thing that will ignite, but properly applicable to those dangerous substances which consume spontaneously, with the emission of heat and light, and which railway companies, carriers, and vessels therefore refuse to carry.

Combustion, the act of taking fire and burning. A substance which, like coal or wood, cheaply answers the purpose of producing great heat and light is called fuel, and the phenomenon of that production is called *C.* Now, modern discovery has ascertained that, in every instance, *C.* is merely an appearance which accompanies the mutual action, when very intense, of two substances in the act of forming an intimate or chemical union. Where that act is less energetic, the heat produced is less intense, and there is no light. Thus, water and sulphuric acid when mixing produce great heat, but no light. Water and quick-lime produce still greater heat; sufficient, it is known, to set fire to a ship in which the mixture unfortunately occurs. It is an occurrence of the same kind when heat is evolved from an acid dissolving a metal; and it is still of the same kind when a mass of coal or wood in a fire-grate is, with the appearance of *C.*, undergoing solution in the oxygen of the atmosphere. In this last case, however, the temperature of the fuel is, by the very intense action, raised so much that the fuel becomes incandescent or luminous; an appearance assumed by every substance, whether burning or not, — of a stone, for instance, or piece of metal, — when heated beyond the temperature indicated by 800° F. The inferior degrees of such incandescence are called *red heat;* the superior degrees, *white heat.* The reason why any strongly heated body throws out light we cannot yet explain. When a quantity of wood or coal has been burned to ash in a confined portion of air, the whole of the fuel, vanished from view, is held in solution by the air, as salt is held in water, and

is again recoverable by the art of the chemist. The phenomenon of common fire, or *C.*, then, is merely the fuel being chemically dissolved in the air of the atmosphere. If the fuel has nothing volatile in it, as is true of pure carbon, and nearly true of coke and charcoal, it burns with the appearance of red-hot stones; but if there be an ingredient, as hydrogen, which, on being heated, readily assumes the form of air, that ingredient dilates before burning, and in the act produces the more bulky incandescence called flame.

Comedian, one who plays other than tragic parts.

Comestibles, the French general term for provisions, eatables.

Comfit, a dry sweetmeat; seeds coated or crusted with sugar.

Comfrey, the root of the common comfrey (*Symphytum officinale*) has been used medicinally; that of the prickly comfrey (*S. asperrimum*), a gigantic species, is favorably spoken of as a green food for cattle.

Commandery. See CYPRUS WINES.

Commanditaire, a dormant or sleeping partner in a French joint-stock company; one who supplies the capital requisite to carry on business, but is only liable for the sum he invests.

Commandite (Société en), a French partnership or company, consisting of a number of individuals, of whom one or more undertake the management, and are held indefinitely responsible for all engagements, as in the case of ordinary partnerships; and the others are mere shareholders, responsible only to the amount of their contributions, either paid up or contracted to be paid into the joint-stock of the association. — The first, called the *commandités*, may be designated managing partners; and the second, called *commanditaires*, non-responsible partners, or simply shareholders. The managing partners are liable in their whole fortunes; the others only in a limited sum.

Commassee, a small Arabian coin, about the size of a sixpence, consisting of 7 carats; it contains little silver, and may be taken to be worth 2 cents. From 40 to 60 commassees generally pass for a dollar at Mocha.

Commedador Balsam, a compound tincture of benzoin used in Brazil.

Commerçant, the French general term for merchant, trader, and dealer.

Commerce [Lat. *commutatio mercium*], as its name implies, is the exchange of one commodity or production for another, thus including the domestic and the foreign trades. In its general acceptation, however, *C.* is the international traffic in goods, or what constitutes the foreign trade of all countries as distinct from their domestic trade. All subjects and questions relating to *C.* being treated, in this work, under the various titles to which they refer, our present object is merely to show the nature, influence, and actual condition of *C.* in general. *C.* is only productive of wealth in an indirect manner. The merchant produces no alteration on the articles which he buys or sells: he merely exchanges one commodity for another; and, in general, what is given is the exact equivalent to what is received. The advantage of *C.* — and it is difficult to overestimate its importance — consists in the uninterrupted scope and efficiency which it gives to the division and distribution of labor, by placing it in the power of individuals to prosecute continuously such employments as suit their taste and capacities. While the exchange of different products is carried on by the producers themselves, they must unavoidably lose a great deal of time, and experience many inconveniences. Were there no merchants, a farmer wishing to sell his crop would be obliged, in the first place, to seek for customers, and to dispose of his corn as nearly as possible in such quantities as might suit the demands of the various individuals inclined to buy it; and after getting its price, he would next be obliged to send to 10 or 20 different and, perhaps, remote places, for the commodities he wanted to get in its stead. So that, besides being exposed to a world of trouble and inconvenience, his attention would be continually diverted from the labors of his farm. Under such a state of things, the work of production, in every different employment, would be meeting with perpetual interruptions, and many branches of industry that are successfully carried on in a commercial country would not be undertaken. The establishment of a distinct mercantile class effectually obviates these inconveniences. When a set of dealers erect warehouses and stores for the purchase and sale of all descriptions of commodities, every producer, relieved from the necessity of seeking customers, and knowing beforehand where he may at all times be supplied with such products as he requires, devotes his whole time and energies to his proper business. The intervention of merchants gives a continuous and uninterrupted motion to the plough and the loom. Were the class of traders annihilated, all the springs of industry would be paralyzed. The numberless difficulties that would then occur in effecting exchanges would lead each particular family to endeavor to produce all the articles they had occasion for: society would thus be thrown back into primeval barbarism and ignorance; the divisions of labor would be relinquished; and the desire to rise in the world and improve our condition would decline, according as it became more difficult to gratify. What sort of agricultural management could be expected from farmers who had to manufacture their own wool, and make their own shoes? And what sort of manufacturers would those be who were every now and then obliged to leave the shuttle for the plough, or the needle for the anvil! A society without that distinction of employments and professions resulting from the division of labor, that is, *without C.*, would be totally destitute of arts or sciences of any sort. It is by the assistance each individual renders to and receives from his neighbors, by every one applying himself in preference to some peculiar task, and combining, though probably without intending it, his efforts with those of others, that civilized man becomes equal to the most gigantic efforts, and appears endowed with almost omnipotent power. The mercantile class has generally been divided into two subordinate classes, — the wholesale dealers and the retail dealers. The former purchase the various products of art and industry in the places where they are produced, or are least valuable, and carry them to those where they are more valuable, or where they are more in demand; and the latter, having purchased the commodities of the wholesale dealers or the producers, collect them in stores, and sell them in such quantities and at such times as may best suit the public demand. These classes of dealers are alike useful; and the separation that has been effected between their employments is one of the most advantageous divisions of labor. The operations of the wholesale merchant are analogous to those of the miner. Neither the one nor the other makes any change on the bodies which he carries from place to place. All the difference between them consists in this, — that the miner carries

them from below ground to the surface of the earth, while the merchant carries them from one point to another on its surface. Hence it follows that the value given to commodities by the operations of the wholesale merchant may frequently exceed that given to them by the producers. The labor or expense required to dig a quantity of coal from the mine does not exceed what is required for its conveyance from Pittsburg to New York; and it is a far more difficult and costly affair to fetch a piece of timber from a remote forest to Philadelphia than to cut down the tree. In this respect there is no difference between commerce and agriculture and manufactures. The latter give utility to matter by bestowing on it such a shape as may best fit it for ministering to our wants and comforts; and the former gives additional utility to the products of the agriculturist and manufacturer by bringing them from where they are of comparatively little use, or are in excess, to where they are of comparatively great use, or are deficient. If the wholesale merchant were himself to retail the goods he has brought from different places, he would require a proportional increase of capital; and it would be impossible for him to give that exclusive attention to any department of his business which is indispensable to its being carried on in the best manner. It is for the interest of each dealer, as of each workman, to confine himself to some one business. By this means each trade is better understood, better cultivated, and carried on in the cheapest possible manner. But whether carried on by a separate class of individuals or not, it is obvious that the retailing of commodities is indispensable It is not enough that a cargo of tea should be imported from China, or a cargo of sugar from Cuba. Most individuals have some demand for these articles; but there is not, perhaps, a single private person requiring so large a supply for his own consumption. It is clear, therefore, that they must be *retailed;* that is, they must be sold in such quantities and at such times as may be most suitable for all classes of consumers. And since it is admitted, on all hands, that this necessary business will be best conducted by a class of traders distinct from the wholesale dealers, it is impossible to doubt that their employment is equally conducive as that of the others to the public interest, or that it tends equally to augment national wealth and comfort. The observations already made serve to show the influence of the home trade in allowing individuals to confine their attention to some one employment, and to prosecute it without interruption. But it is not in this respect only that the establishment of the home trade is advantageous. It is so in a still greater degree by its allowing the inhabitants of the different districts of the country to turn their labor into those channels in which it will be most productive. The different soils, different minerals, and different climates of different districts fit them for being appropriated, in preference, to certain species of industry. Hence it follows that the inhabitants of different districts, by confining themselves to those branches of industry for the successful prosecution of which they have some peculiar capability, and exchanging their surplus produce for that of others, will obtain an incomparably larger supply of all sorts of useful and desirable products than they could do were they to apply themselves indiscriminately to every different business. The territorial division of labor is, if possible, even more advantageous than its division among individuals. The inhabitants of the richest and most extensive country, provided it were divided into small districts without any intercourse with each other or with foreigners, could not, how well soever labor might be divided among themselves, be otherwise than poor and miserable. Some of them might have a superabundance of corn, at the same time that they were wholly destitute of coal and iron; while others might have the largest supplies of the latter articles, with but very little grain. But in commercial countries no such anomalies can exist. Opulence and comfort are there universally diffused. The labors of the mercantile class enable the inhabitants of each district to apply themselves principally to those employments that are naturally best suited to them. This superadding of the division of labor among different states to its division among different individuals renders the productive powers of industry immeasurably greater; and augments the mass of necessaries, conveniences, and enjoyments in a degree that could not previously have been conceived possible, and which cannot be exceeded except by the introduction of foreign *C*. The roads and canals that intersect a country, and open an easy communication between its remotest extremities, render the greatest service to internal *C.*, and also to agriculture and manufacture. A diminution of the expense of freight has, in fact, the same effect as a diminution of the direct cost of production. If coal brought into a city sell at $4 a ton, of which the freight amounts to a half, or $2, it is plain that, in the event of an improved communication, such as a railroad or a canal, permitting to import it for half the previous expense, its price will immediately fall to $3 a ton; just as it would have done had the expense of extracting it from the mine been reduced a half. In other respects, the advantages resulting from improved communication are probably even more striking. They give the same common interest to every different part of the most widely extended country; and put down, or rather prevent, any attempt to monopoly on the part of the dealers of particular districts, by bringing them into competition with those of all the others. Nothing in a country enjoying great facilities of communication is separate and unconnected. All is mutual, reciprocal, and dependent. Every man naturally gets into the precise situation that he is best fitted to fill; and each, coöperating with every one else, contributes to the utmost of his power to extend the limits of production and civilization. — What the home trade is to the different regions of the same country, *foreign trade* is to all the countries of the world. Particular countries produce only particular commodities, and, were it not for foreign *C.*, would be entirely destitute of all but such as are indigenous to their own soil. It is difficult for those who have not reflected on the subject to imagine what a vast deduction would be made, not only from the comforts, but even from the necessaries, of every commercial people, were its intercourse with strangers stopped. One country has peculiar capacities for raising corn and cotton, but is at the same time destitute of coffee, tea, and sugar; another, again, has peculiar facilities for raising the latter, but is destitute of the former; and it is impossible to point out a single country which is abundantly supplied with any considerable variety of commodities of domestic growth. Providence, by giving to each particular nation something which the others want, has evidently intended that they should be mutually dependent upon one another. What has been already stated is suffi-

cient to expose the utter fallacy of the opinion that has sometimes been maintained, that whatever one nation may gain by her foreign commerce must be lost by some one else. *C. is not directly productive*, nor is the good derived from it to be estimated by its immediate effects. What commercial nations give is uniformly the fair equivalent of what they get. In their dealings they do not prey upon each other, but are benefited alike. The advantage of *C.* consists in its enabling labor to be divided, and giving each people the power of supplying themselves with the various articles for which they have a demand, at the lowest price required for their production in those countries and places where they are raised with the greatest facility. *C.* gives no advantage to any one people over any other people; but it increases the wealth and enjoyments of *all* in a degree that could not previously have been conceived possible. But the influence of foreign *C.* in multiplying and cheapening conveniences and enjoyments, vast as it most certainly is, is perhaps inferior to its indirect influence, — that is, to its influence on industry, by adding immeasurably to the mass of desirable articles, by inspiring new tastes, and stimulating enterprise and invention by bringing each people into competition with foreigners, making them acquainted with their arts and institutions, and giving to each particular country the means of protecting by the inventions and discoveries of others as much as by those of her own citizens. "*C.* has acquired in our time," says R. Somers, "a security and extension, in all its most essential conditions, of which it was void in any previous age. It can hardly ever again exhibit that wandering course from route to route, and from one solitary centre to another, which is so characteristic of its ancient history, because it is established in every quarter of the globe, and all the seas and ways are open to it on terms fair and equal to every nation. Wherever there is population, industry, resource, art, and skill, there will be international trade. *C.* will have many centres, and one may relatively rise or relatively fall; but such decay and ruin as have smitten many once proud seats of wealth into dust cannot again occur without such cataclysms of war, violence, and disorder as the growing civilization and reason of mankind and the power of law, right, and common interest forbid us to anticipate. But with all these advantages, it must not be supposed that the future course of trade is free of difficulty. The very magnitude of *C.* now suggests what serious work devolves on all who are engaged in it. If in the older times it was thought that a foreign merchant requires to be not only a good man of business, but even a statesman, it is evident that all the higher faculties of the mercantile profession must still more be called into request when imports and exports are reckoned by hundreds instead of fives or tens of millions, when the markets are so much larger and more numerous, the competition so much more keen and varied, the problems to be solved in every course of transaction so much more complex, the whole range of affairs to be overseen so immensely widened. It is not a company of merchants, having a monopoly, and doing whatever they please, whether right or wrong, that now hold the *C.* of the world in their hands, but large communities of free merchants in all parts of the world, affiliated to manufacturers and producers equally free, each under strong temptation to do what may be wrong in the pursuit of his own interest, and the only security of doing right being to follow steady lights of information and economic science common to all. Easy transport of goods by land and sea, prompt intelligence from every point of the compass, general prevalence of mercantile law and safety, have all been accomplished; and the world is opened to trade. But intellectual grasp of principles and details, and the moral integrity which is the root of all commercial success, have to be severely tested in this vaster sphere." See BALANCE OF TRADE, EXCHANGE, IMPORTS AND EXPORTS, PROTECTION AND FREE TRADE, etc.

Commerce, a fire insurance Co. of Albany, New York, organized in 1859. Statement on Jan. 1, 1879: — Capital stock, $200,000; net surplus, $163,805; total cap. and surpl. $363,805. Risks in force, $9,263,820; premiums, $86,236. Premiums received since the organization of the Co., $2,966,470; losses paid, $2,075,107; cash dividends paid to stockholders, $474,000; cash dividend paid in 1878, $32,000.

Commercial, pertaining to commerce or trade; mercantile trading; according to the rules or usages of commerce.

Commercial, a fire insurance Co. of New York City organized in 1850. *Statement* on Jan. 1, 1879: — Capital stock, $200,000; net surplus, $170,523; total cap. and surplus, 370,523. Risks in force, $34,848,029; premiums, $228,953. Premiums received since the organization of the Co., $3,570,521; losses paid, $1,920,594: cash dividends paid to stockholders, $776,000. Cash dividend paid in 1878, $35,846.

Commercial Agent, an officer appointed to act in the capacity of a consul in a foreign port.

Commercial College, a school for the instruction of young men in the rudiments of commercial knowledge.

Commercial Law, such customs and usages of trade as are so well established as to become fixed in the public mind, and acquiesced in by the trading community; usages of trade recognized by courts of justice; judicial decisions on commercial contracts or transactions. *McElrath.*

Commercial Paper, promissory notes, bills of exchange, or drafts, made and given for merchandise.

Commercially, in a commercial manner or view.

Commettant [Fr.] a principal or constituent; one who employs.

Commings, a malster's name for the shoot of the barley after being kiln-dried.

Commis, a clerk or shopman in France.

Commissariat, the provisioning department of an army or other large body.

Commissary, an officer charged with the supply of provisions, medical stores, and clothing for troops, bodies of travellers, etc.

Commission, order or authority by which one person trades for another: as, a *commission* to buy cotton. — Brokerage, allowance, or compensation made to a factor, agent, etc., for transacting the business of another. It is usually charged at so much per cent, the amount being regulated either by stipulation or the usage of trade. A *C. del credere* is a higher rate charged in those cases where the agent guarantees his dealings, or, in other words, engages to be answerable, as if he himself were the proper debtor. See DEL CREDERE.

Rates of C. on general Business, recommended by the Chamber of Commerce of New York, to be charged where no express agreement to the contrary exists: — On sales of sugar, coffee, tea, and general merchandise, usually sold in large quantities, and on credit under six months, or for cash, 5%. — On sales of manufactured goods, and other articles usually sold on long credits, for commissions and guarantee, 7½%. — On sales of

manufactured goods, and other articles usually sold on long credits, for commissions and guarantee, for cash, 5% — On purchase and shipment of merchandise with funds in hand, on cost and charges, 2½%. — Collecting delayed and litigated accounts, 5%. — Effecting marine insurance, on amount insured, ½%. — *No charge to be made for effecting insurance on property consigned* — Landing and re-shipping of goods from vessels in distress — on value of invoice, 2½%. — Landing and re-shipping of goods from vessels in distress — on specie and bullion ½%. – Receiving and forwarding merchandise entered at Custom House, on invoice value *one per cent*, and on expenses incurred, 2½%. — On consignments of merchandise withdrawn or re-shipped, full commissions are to be charged, to the extent of advances or responsibilities incurred, and one half commission on the residue of the value. — The risk of loss by robbery, fire (unless insurance be ordered), theft, popular tumult, and all other unavoidable occurrences, is, in all cases, to be borne by the owners of the goods, provided due diligence has been exercised in the care of them.

Commission-Merchant, *C.*-broker, *C.*-agent, a merchant, broker, or agent who transacts business for others, at a certain percentage; as commission and recompense for his services.

Commissionnaire, a French factor or merchant who buys and sells goods for others; one who attends to the transport of goods; a messenger.

Committee, a delegated or selected body of persons appointed to act for a society or company; and which may be either provisional or permanent.

Commitment, a warrant of committal to prison.

Commode, a piece of bedroom furniture; a night-stool; a set of drawers.

Commodities, merchandise; wares; goods; produce of land and manufactures.

Common, a public unenclosed ground.

Commonage, the right of feeding cattle on a common.

Common Carrier, one who conveys the goods of another for hire. In its mere colloquial use the term was applied to the class of men, now rendered comparatively obsolete by the railroad system, who conveyed goods in carts or wagons on the public roads. In jurisprudence, however, the term is collectively applied to all conveyers of property, whether by land or water, and in this sense the late changes and enlargements of the system of transit throughout the world have given additional importance to the subject. The law recognizes a distinction between a *common* and a *private* carrier. The former is one who holds himself out to the public as ready to carry for hire from place to place the goods of such persons as choose to employ him. The owner of a stage coach, a railroad company, the master of a general ship, are common carriers. It has been held, however, that a person who carries only passengers is not a common carrier; nor of course is a person who merely engages to carry the goods of particular individuals. If a man undertakes to carry goods safely, although he is not a common carrier, and is to have nothing for the carriage, he is responsible for damage sustained by his negligence. A common carrier is subject at law to peculiar liabilities He is bound to carry the goods of any person who offers to pay his hire, unless there is a good reason to the contrary, as, for example, when his carriage is full, or the article is not such as he is in the habit of conveying. He ought to carry the goods in the usual course without unnecessary deviation or delay. To make him liable there must be a due delivery of the goods to him in the known course of his business. His charge must be reasonable; and he must not give undue preference to any customer or class of customers. The latter principle has come to be of great importance in the law of railroad companies. In respect of goods entrusted to him, the carrier's liability, unless limited by a special contract, is, as already stated, that of an insurer. There is no question of negligence as in the case of injury to passengers, for the warrant is simply to carry safely and securely. The law, however, excepts losses or injuries occasioned immediately "by the act of God or the enemies of the U. States" — words which have long had a strict technical signification. It would appear that concealment without fraud, on the part of the customer, will relieve the carrier from his liability for *negligence*, but not for actual *misfeasance*. Fraud or deceit by the customer, (*e.g.*, in misrepresenting the real value of the goods) will relieve the carrier from his liability. The responsibility of the carrier ceases only with the delivery of the goods to the proper consignee. Should the article or parcel exceed $50 in value, the carrier is not to be liable for loss unless such value is declared by the customer, and the carrier's increased charge paid. Where the value is thus declared, the carrier may, by public notice, demand an increased charge, for which he must, if required, sign a receipt. Failing such receipt or notice, the carrier must refund the increased charge and remain liable as at common law. Except as above no mere notice or declaration shall affect a carrier's liability, but he may make special contracts with his customers. The carriage of goods by railroad or canal, or by sea, is subject to special regulations. (See RAILROADS and CHARTER PARTY.) A carrier of passengers is responsible for personal injuries only when they have been occasioned by his negligence or want of skill. Where there has been contributory negligence on the part of the plaintiff, — *i.e.*, where he might, by the exercise of ordinary care, have avoided the consequences of the defendant's negligence, — he is not entitled to recover. When a person's death has been caused by such negligence as would have entitled him to an action had he survived, an action may be maintained against the party responsible for the negligence on behalf of the wife, husband, parent, or child of the deceased.

Common-Council, a body of councillors selected by citizens to represent and attend to municipal interests.

Common-Hall, the hall or meeting-place of a town council, or corporate body.

Common-Pitch, a building term implying that the length of the rafter is ¾ of the span.

Common-place Book, a memorandum or jotting book.

Common State, a term for the grade of flour made of spring wheat, with nothing but the bran bolted out.

Commonwealth, a fire insurance Co. of Boston, Mass., organized in 1875. *Statement* on Jan. 1, 1879: — Capital stock paid up, $500,000; net surplus, $13,215; total cap. and surplus, $513,215. Risks in force, $22,236,075; premiums, $241,415. Premiums received since the organization of the Co., $688,625; losses paid, $230,569; cash dividends paid to stockholders, $55,000. Cash dividend paid in 1878, $25,000.

Communion-Table, a piece of church furniture at the east end of a church, within the railed altar.

Compadore, in India, a butler or purveyor.

Companion, the wooden covering or hood of the ladder-way leading to the cabin in a merchant ship. — An associate, fellow-traveller, or workman.

Companion-Ladder, the steps leading from the poop to the main deck, or from the deck to the cabin of a ship.

Company, an association of persons for the prosecution of a common undertaking. In carrying on those costly enterprises in which the capital of a commercial country is employed, the resources and the mind of one person are often inadequate. They require the combined capital and industry of many, with the unity of purpose and of person which belongs to an individual. Hence the origin of *C.*, of which the following kinds may be distinguished: — *Private C.*, or voluntary associations of two or more persons for the acquisition of profit, with a contribution for that end, of stipulated shares of property and industry; accompanied by an unlimited mandate to each partner to bind the *C.* in the line of its employment, and a guarantee to third parties of all the engagements undertaken in the social name. *C.* of this kind may be subdivided into *partnership* and *joint-adventure*, under which heads, respectively, these contracts are fully described. — *Joint-Stock C.* differ from the preceding in respect, — 1st, That the credit is placed on the joint-stock of the *C.*, as indicated by a descriptive name, instead of being personal, as indicated by a firm; 2d, That the management is delegated by the partners to a body of directors; and, 3d, That the shares are transferable. — *Public* or *Chartered C.* are of different kinds. A State charter enables a joint-stock *C.* to enjoy the privileges of a corporation, and trade under a limited responsibility; the shares of such a *C.* are transferable; the *C.* itself undissolved by the death or bankruptcy of partners; and the management and title to pursue are vested in the officers appointed according to the charter. — See CORPORATION, JOINT-ADVENTURE, JOINT-STOCK COMPANY, LIMITED LIABILITY, and PARTNERSHIP.

Comparateur, a German instrument for accurately ascertaining the length of measures after Bessel's mode. The micrometers are placed on a strong mahogany beam; and the slide, which carries the two measures to be compared, is so arranged that it moves them exactly behind one another in the micrometer line, and there retains them.

Compartment, a specific division of the intermediate spaces. Warehouses are frequently built in *C.* for precaution against fire. Ships are often built with water-tight *C.* for greater security against accidents.

Compass (The Mariner's) [Dutch, *zee-kompass*; Fr. *boussole, compas de mer*; Ger. *ein Kompass*;

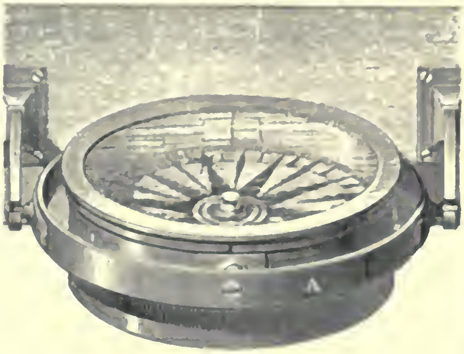


Fig. 95. — MARINER'S COMPASS.

It. *bussola*; Port. *compasso de marear*; Sp. *aguja de marear*], an instrument employed in directing the course of vessels at sea. It consists of a circular card, having a magnetized needle attached to the back of it, so as to form one of its diameters; this diameter being supported on a point, and exactly balanced on its centre, turns freely round with the card, which by a particular contrivance is so suspended within a cylindrical box (Fig. 95) that it remains perfectly horizontal, notwithstanding the irregular motions to which a ship is liable at sea. It is the property of the needle, when thus balanced, to point *nearly* to the North Pole, whence, by simply looking at the position of the needle, the mariner can see the direction in which the vessel is sailing, and regulate his steering accordingly. The course indicated by the needle, however, is only the *magnetic* bearing, which is seldom the true direction, for the magnet rarely points exactly north, being subject to two errors from different causes, called the *variation* and the *deviation*. The former is the result of a slow progressive alteration in the position of the magnetic pole, which, within certain limits, moves from east to west, and back again from west to east. The variation of the *C.* is very different in different parts of the globe, and must therefore be determined at sea by comparing the true bearing of a celestial object with its bearing by *C.* which is done by a finer instrument called an *azimuth C.* (Fig. 96) which is graduated in degrees instead of being divided by

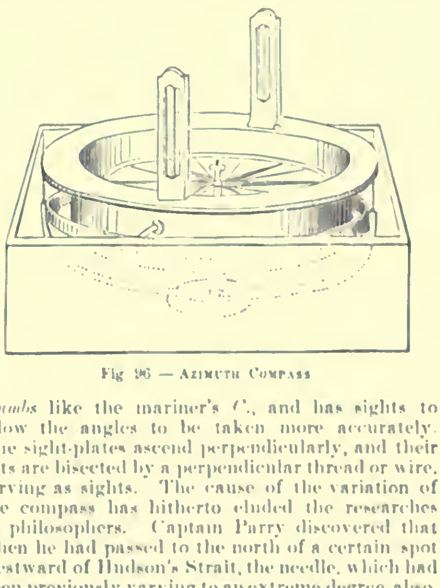


Fig. 96. — AZIMUTH COMPASS

rhumbs like the mariner's *C.*, and has sights to allow the angles to be taken more accurately. The sight-plates ascend perpendicularly, and their slits are bisected by a perpendicular thread or wire, serving as sights. The cause of the variation of the compass has hitherto eluded the researches of philosophers. Captain Parry discovered that when he had passed to the north of a certain spot westward of Hudson's Strait, the needle, which had been previously varying to an extreme degree, absolutely went half round the compass, and this continued to be the case until he had sailed considerably farther north. Whether this peculiar attraction had any reference to the real magnetic pole, further observations will perhaps determine. — The *deviation* of the compass is a local error, occasioned by the attraction of iron on board ship. It has been the cause of numerous shipwrecks before the invention of the ingenious method of discovering its amount. The *dip* of the needle is a deviation from its horizontal line; it is different in different places, and, like the variation, undergoes slow changes; its diurnal change is not perceptible. The inventor of the mariner's *C.* is not known. It was employed in Europe in navigation, about the middle of the 13th century, but the exact date of its introduction is matter of doubt. The Chinese, however, are said to have been acquainted with it much earlier.

The attractive power of the loadstone was known to the ancient Egyptians, but was not by them applied to any practical purpose.

Compass-Board, an upright board of the fancy-weaving loom, through which pass the neck-twines.

Compass-Brick, a kind of brick with a curved face, used for forming the walls of wells.

Compass-Card, the suspended card on which the points of the compass are drawn.

Compasses, a two-legged instrument or tool for making arcs and circles, and for measuring distances. There are several varieties of *C.*, as wing, rack, club, millwright's, drawing, curb, and proportionate *C.*, and *C.* with cutting-leg for paper.

Compass-Plane, a plane which has a curved face, used to work on concave surfaces.

Compass Saw, a saw with narrow blade for cutting circles.

Compensation, a remuneration or reward; a recompense for injury, breach of agreement, etc.

Compensation-Balance, a spring or other contrivance to equalize temperature, or to recover error from inequality of movement.

Compensation-Pendulum. See PENDULUM.

Compera, the Italian for purchase or bargain.

Competition, a rivalry, the contention for a contract, for business, for supremacy in workmanship, etc.

Compilation, a collection of laws; a selection of passages, etc.

Complaisance, the French word for accommodation; *billet de C.* is an accommodation note or bill.

Complement, the full amount; a complete set of any thing.

Compo., Roman cement; concrete or mortar.

Component, a constituent part; an ingredient.

Composer, a musical author.

Composing, the practical business of picking up and arranging the letter-types for printing, spacing, and justifying the lines, etc.

Composing-Draught, an opiate or soothing draught.

Composing-Frame, a printer's elevated working-frame, on which the cases of type are rested obliquely.

Composing-Machine, an ingenious and complicated machine, invented for setting and arranging type, which is worked by keys like a pianoforte. These machines, however, have always some practical defects, the spacing and making up into lines still requiring to be performed by hand.

Composing-Rule, a printer's adjusting measure.

Composing-Stick, an iron, brass, or wooden frame, held in the hand by a compositor or typesetter, in which he arranges the letters and words into lines for book or newspaper work.

Composition, the union of several substances or parts. — A musical production. — In printing, the art of setting up type. — The commercial name for an arrangement or legal compromise with creditors, made by a debtor who is unable to pay his liabilities in full, a portion of the debt being taken in lieu of the full demand; in French, this is called *concordat*. See INSOLVENCY.

Composition Candles, stearine or other hard candles which do not waste or burn too freely.

Composition Cloth, a material made from long flax, and dressed with a solution which renders it waterproof. It is used for trunk-covers, etc.

Compositor, a type-setter engaged in picking up, arranging, and distributing letters or type in a printing-office.

Compost, a manure in which the dung of animals, or other organic matter, is mixed largely with earth, mould, lime, and other inorganic matter.

Compote [Fr.], fruits prepared in syrup.

Compound, a mass or body composed or formed of two or more elements, ingredients, or different substances; as, a chemical *compound*.

Compounder, a distiller or rectifier; a preparer of sweetened cordials.

Compounding, mixing. — A composition or arrangement made with creditors. See COMPOSITION.

Compound Interest. See INTEREST.

Compound Steam-Engine. See STEAM-ENGINE.

Compress, to condense or squeeze into a small compass. — A linen pad.

Compressed Air-Engine, a machine driven by the elastic force of compressed air. Its construction is usually like that of a steam-engine, the force of the expanding air being exerted against a piston in a cylinder.

Compressed Yeast, the trade name of a kind of yeast made expressly for baking purposes from selected grain and the purest spring water, and then pressed to free it from all watery substances. This valuable preparation was introduced and first manufactured in this country a few years ago by Messrs. Gaff, Fleischmann, & Co., but it has been known and used in Europe for the last century, and to it the well-known excellence of the white Vienna bread is in great part attributed. It is well known that the preparation of bread is essentially based upon the fact that, by the act of fermentation, which is caused by the yeast, the gluten of the flour forms a cellular tissue by which the escape of the carbonic acid is arrested, thus rendering the bread porous and spongy, and increasing its digestibility; but the fungoid character of yeast, and its action in inducing fermentation, are not generally well understood. Yeast and other ferments differ from the other lower organisms only in possessing the faculty of living and multiplying regularly and continuously without contact with the atmosphere. Instead of requiring free oxygen to burn the materials which serve for their nutrition, they obtain the necessary vital heat by living upon oxygenated bodies like sugar, which evolve caloric in their decomposition. This property appears to explain the mystery of fermentation, which, according to the French chemists, Pasteur and Dumas, is the chemical decomposition of sugar by the vital force of yeast cells. In its first stage of growth, the yeast plant consists entirely of sporules, which vary in size and form, but generally contain one or two nuclei, the germs of future sporules. After the lapse of some days, and under favorable circumstances, the sporules become much elongated, and form roots from which vertical threads spring up. These, when the plant has reached its complete development, become branched, each branch bearing at its extremity a row of rounded and bearded corpuscules which are about the size of the sporules, but differ from the latter in their darker and firmer texture. The yeast plant is remarkably delicate; if not kept free from any deleterious substances or impurities, its sporules die or lose the vigor necessary to good fermentation. This delicacy renders it most important that the yeast used should be as fresh as possible; for if it is kept any length of time it loses its essential properties for making light and sweet bread. Compressed yeast, however, can be kept by dissolving it in pure water, placing it in a glass

bottle, and lowering it by a string into a well. When required for use, the water should be poured off, and the yeast will be found to have settled at the bottom. When enough has been taken from the bottle, fresh water should be added and the process repeated. In this manner it is said it will keep for a long time, or as long as the temperature is kept under 56° F.

Compromise, an adjustment of differences between parties by individual or mutual concession; an arrangement with creditors.

Comptant, the French term for ready money, cash, specie.

Comptoir [Fr.], a counting-house, a store-counter or general factory.

Comquat, a curious small nutmeg-shaped orange, the *Citrus olivæformis* of China, occasionally imported into this country preserved.

Concentrated Milk. See MILK.

Concern, persons connected in business, or their affairs in general; as, a solvent *concern*.

Concertina, a small hexagonal musical instrument, the bellows of which are usually of an octagonal shape, and the reeds and keys are contained in both boards, so as to be played on by pressing the fingers of each hand. See MELODEON.

Concession, the act of conceding, granting, or yielding. — The thing yielded; a grant. — In France, a right or privilege granted by government to some company engaged in the formation or construction of a public work.

Concessionnaire [Fr.], the grantee to whom a privilege or concession has been made.

Conchologist, one versed in the natural history of shells and their inhabitants; a dealer in ornamental shells.

Conch-Shell, a common name in the West Indies for the helmet or casket shells, which are there used (a mouth-hole having been made at the spiral end) to blow as trumpets, to call in the laborers from work. Hence, the term "shell-blow" there implies a period for refreshment, or a withdrawal from labor. See CHANKS.

Conchum, a dry measure in Mysore of 8 lbs.

Concordat [Fr.]. See COMPOSITION.

Concrete, an artificial cement formed of lime, sand, pebbles, or other materials, frequently used for the foundations of buildings. See BOSTON.

Condenser, any apparatus used for cooling heated vapors and reducing them to a liquid form. In ordinary distillation, the worm-tub (D, Fig. 98) is the condenser most generally adopted. It consists of a spiral tube, which passes through a tub constantly filled with cold water. The vapor enters the tube at the top, and being condensed in its passage, runs out as liquid at the bottom. The *C. of a steam-engine* is that part attached to the cylinder where the steam is condensed. The *pneumatic C.* is a syringe worked on the same principle as the force-pump, by which a large quantity of air can be forced into a given space. See DISTILLING, STEAM-ENGINE.

Conder, a person at the herring fishery, who, from an elevated position, by signal, directs the course of the boats, so that they may enclose the schools of fish in their nets.

Condiment, seasoning or flavoring substances for food, as mustard, pepper, vinegar, sugar, salt, etc.

Condit [Fr.], sweetmeats, preserves, pickles.

Conditioning Silk, a trade term for the assaying of silk in order to test the proportions of moisture it contains.

Conditions of Sale, certain stipulations and agreements which are usually stated on catalogues of property to be disposed of by auction, and which are frequently read out previous to the sale, and considered binding on the bidders, purchaser, and vender.

Conditor [Ger.], a confectioner.

Condongo, a long kind of Spanish raw silk of low quality.

Condorin, a Japanese and Chinese coin, the tenth part of a mass, and worth about ⅜d.

Conducta, a convoy or caravan of mules or horses in Mexico, etc., conveying money or the precious metals from one place to another inland, or to a seaport for shipment.

Conductor, one who has charge of a public travelling carriage, as a car, or train of cars, on a railroad. — A metallic rod affixed to any great elevation, to carry off the lightning fluid without doing damage to the ship or building; any substance which attracts electricity, and transmits it.

Conduit, Conduct, a pipe or channel for conveying water; the term was formerly applied to stone buildings erected in some central place over a fountain to supply water to the inhabitants.

Cones, the seeds of pine-trees. — Beautiful and very valuable species of shells (Fig. 97), some being exceedingly scarce.

Fig. 97. CONE-SHELL.

Conessi Bark, the bark of *Wrightia antidysenterica*, which is astringent and bitter, and also deemed febrifuge, in India.

Coney Skins, the commercial name for the dressed skins of rabbits. They are often dyed in imitation of more costly furs. *C.-plates* are parts of *C.* skins sewed together and used for linings and for manuf. of children's cloaks. *Imp.* duty, 35 per cent.

Confect, a comfit.

Confection, a sweetmeat, a preserve; also a medicinal conserve or hard electuary, of which there are many kinds, as opiate confection, aromatic confection, confection of senna, etc. Saccharine matter enters into the composition in different proportions for various objects.

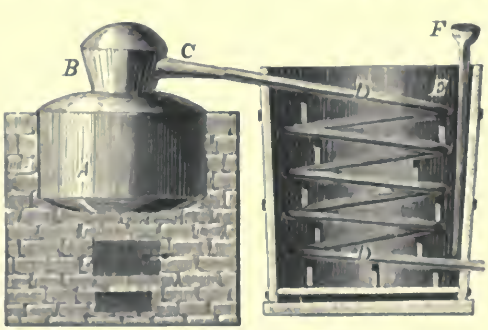


Fig. 98. — STILL-CONDENSER.

Confectioner, a maker of sweetmeats or confections.

Confectionery may be regarded as the art of imparting color, form, and fragrance to sweet substances. The forms which the confections take

are *lozenges, drops, candies, syrups, rocks, balls, buttons, comfits, cakes, sticks, jujubes, pastils, bonbons, jellies, jams, preserves, ices, essences, liqueurs, ratafias,* etc. The substances employed are *sugar, treacle, honey, fruits, seeds, flowers, spices,* together with *coloring* and *fragrant* substances in large variety. As a general rule, the confections require only very simple apparatus in making them; but there are two varieties worthy of a few words of separate notice. *Caraway comfits,* or *sugar-plums,* each contain a caraway or some other small seed. The seeds are thrown into a copper pan with a mixture of syrup and starch; heat is applied underneath, and the pan is rolled about in such a way that every seed takes up its own coating of mixture to such a thickness as may be determined. Sometimes the motion of the pan is brought about by machinery. Only comfits of one color can be made at a time. *Lozenges* are made of sugar flavored with peppermint or other essences, and colored according to taste. The mixture is worked up like a dough, rolled out flat and thin, and stamped into separate lozenges by cutters of various shapes.

Confettatore, an Italian confectioner.

Confetti, preserves, sweetmeats, comfits, in Italy.

Confit, [Fr.], dogs' excrements prepared for dressing leather; in English termed puer.

Confitures, the French term for preserves.

Confortino, the Italian name for gingerbread.

Congie, an Indian name for boiled rice.

Congius, the pharmaceutical name for a gallon.

Congou, black tea, a superior kind of Bohea, larger leaf and less dusty, and that which is most extensively imported from China, the consumption exceeding 50 million pounds per annum.

Congreve Lights. See MATCHES.

Congreve Rocket. See ROCKET.

Conicopoly, the name for an accountant or clerk in some of the Indian provinces.

Connaissement, the French name for bill of lading.

Connecticut, a State of New England, one of the smallest of the U. States; but one of the most important for the variety and value of its manufactured products. It lies between lat. 40° 58′ and 42° 21′ N., lon. 71° 53′ and 73° 50′ W.; being bounded N. by Massachusetts, E. by Rhode Island, S. by Long Island Sound, and W. by New York. Its length E. to W. is 90 m.; and its average breadth about 52 m. Area 4,730 sq. m. The surface of *C.* is much diversified, but there is no land above 1,000 feet in elevation. The three principal rivers are the Connecticut, the Housatonic, and the Thames. The Connecticut is the largest river in New England. It rises on the N. border of New Hampshire, 1600 feet above the sea, and falls into the Sound at Saybrook, after a course of about 400 m. It is navigable to Middletown (30 m.) for vessels drawing 10 feet, and to Hartford (50 m.) for those drawing 8 feet. The E. part of the State is drained by the Thames, which is navigable to Norwich for the Sound steamers and West India trading-vessels. In the W. part of the State is the Housatonic, navigable for small vessels to Derby, where the Naugatuck joins it. *C.* is very rich in mineral resources; it has 20 extensive quarries and mines opened when the last census was taken. Copper is found in the Simsbury mines at Granby and at Bristol; but these mines have lost their former importance since the working of the abundant and purer ores of Lake Superior. Iron ore is very abundant in Salisbury, Kent, Sharon, Cornwall, and Canaan. Limestone and marble of the very best quality are found at Canaan, Washington, and Milford. At Portland and Cromwell, on both sides of Connecticut River, are the well-known immense quarries of freestone largely in demand for building. The excellent slate flagging from Bolton and Haddam is abundant in supply, and in great demand. Granite, gneiss, hydraulic lime, tiling slates, clay (fire, potters', and caolin), and sulphates of baryte are found in great quantities. *C.* has over 100 m. of deeply indented coast, affording excellent harbors. The chief of these are Stonington, New London, Saybrook, New Haven, Bridgeport, and Fairfield. The harbor at New London is one of the best in the country, capacious, and never frozen over. The climate of the State, while very changeable, is very healthful; the mean temperature for the year is 48° F. The vegetation is rich and varied. The forests have been recklessly cut away and only patches of woodland remain; but the people are waking up to the importance of tree-planting. Chestnut is the most abundant tree. There is very little soil that can be called good, except in the river valleys, and agriculture is as backward as in other parts of New England. The hills through the State furnish excellent pasturage and cheap fuel. The chief cultivated fruits are apples, pears, grapes, and the numerous kinds of berries. The principal crops are hay, oats, rye, corn, potatoes, and tobacco; and in the Connecticut River valley, farming is very productive. The tobacco raised in the valley is said to be superior to any other. In the uplands dairy products and cattle raising are the chief resources of the farmer. There were in 1879, 25,508 farms, having 1,646,752 acres of improved land, and 717,664 acres unimproved, of which 577,333 were woodland. The value of these farms was $124,241,382. There were in the State 51,100 horses, 110,900 milk-cows, 114,100 oxen and other cattle, 92,500 sheep, and 57,900 hogs. Notwithstanding the extensive sea-coast and fine harbors, the foreign commerce is not heavy, — the coast-trade and fisheries being more important. There are in the State five custom districts of which the ports of entry are Fairfield, Middletown, New Haven, New London, and Stonington. The imports from foreign countries and domestic exports for the year 1878, were as follows: —

Fig. 99. — SEAL OF CONNECTICUT.

Ports.	Imports.	Exports.
Fairfield	$6,191	$1,890
Middletown	58.654	none.
New Haven	1,053,141	3,560,741
New London	261,264	71,787
Stonington	631	none.
Total	$1,379,881	$3,634,418

The chief articles of export were fire-arms, cartridges, shot, machinery, grain, lard, and pork. In 1879 the vessels enrolled, registered and licensed in the several ports of *C.* numbered 840, of which 769 were sailing vessels, with a tonnage of 52,872, and 91 were steam vessels, with a tonnage of 27,028. The fisheries are carried on from New London and Stonington. In 1879 there were 201 vessels engaged in the cod and mackerel fisheries, with a tonnage of 4,665; and in the whale fishery (all belonging to New London) 11 vessels with a

tonnage of 1,552. Engaged in coastwise trade and fisheries, there entered 2,562 vessels and cleared 1,981. In foreign trade there entered 63 and cleared 31. Ship-building is a considerable industry. In 1878 44 vessels were built of 3,263 tons. Pop. in 1870, 537,454. Actual pop. about 600,000. See HARTFORD and NEW HAVEN.

C. owes its importance chiefly to its manufactures. It ranks first among the States in the production of clocks, India-rubber goods, and hardware, an eighth in the total value of all manufactured products. When the last census was taken, the chief industries of *C.* were as follows: —

	Establishments.	Steam-engines. Horse-power.	Water-wheels. Horse-power.	Hands.	Capital.	Annual Product.
					$	$
Cotton goods (of all sorts)	111	800	10,840	12,086	12,710,700	14,024,334
Woollen goods	103	2,258	6,110	7,283	12,470,400	17,365,148
Hardware	145	2,610	1,771	7,246	6,851,225	12,111,074
Iron work (all sorts)	124	2,721	1,480	3,498	5,720,650	7,552,725
Machinery (all sorts)	108	1,424	728	2,770	4,342,641	5,010,279
Paper (all sorts)	66	527	5,007	1,497	2,988,046	4,874,291
Sewing-machines and fixtures	9	815	80	2,525	2,492,000	3,940,000
Plated ware	32	685	490	2,104	2,537,500	4,066,806
Carriages and wagons	205	185	401	2,341	2,202,810	4,164,480
India-rubber and elastic goods	13	1,183	981	1,916	2,245,000	4,239,320
Silk goods	23	401	300	1,703	1,111,170	3,314,843
Fire-arms	8	654	224	1,607	1,793,770	2,222,873
Cutlery and edge tools	41	376	1,046	1,788	1,306,550	2,000,805
Hats and caps	33	534	36	2,464	1,151,200	3,740,871
Clocks; also materials and cases	28	481	430	1,171	1,003,650	7,153
Boots and shoes	281	19	30	2,417	586,800	9,546
Bleaching and dyeing	18	13	258	188	150,100	9,743
Total (the above and all others)	5,128	25,979	54,395	80,521	95,281,278	161,065,474

Railroads and Steamboat lines. In 1878, *C.* had 1 mile of railway to 5.16 square miles of territory, and to 585 inhabitants. (Massachusetts had 1 mile to 4.29 square miles and 909 inhabitants.) There were 24 railroad companies, with 1196 m. of single track. The cost of these was $79,028,657; receipts for the year $10,806,494 (54 per cent from passengers); net earnings, $2,816,004, being 4 per cent on the cost of the roads. The capital stock of all the companies was $45,499,139 (paid in), and debt, $18,011,870. The amount paid in dividends (only seven companies make any) was 4.6 per cent on the entire capital of all the roads, but 9.39 on the capital of the dividend-paying ones. There is an elaborate system of State inspection of the roads and their accounts. There is a State tax of one per cent on the market value of stock and bonds after deducting cash on hand. The principal lines are those running N. and S., connecting the shore with the valleys of the interior, and forming highways between the important cities of New England and New York City. Connected with these are important steamboat lines (passenger and freight) from Stonington, New London, and New Haven to New York.

Banks. The banking interest of the State is commensurate with its large business, and shows a steadily increasing prosperity. At January 1, 1879, there were 79 national banks in the State, with a capital of $25,687,820; 4 State banks, with a capital of $1,450,000, and assets $3,917,953; 10 trust companies, with a capital of $2,725,000, and assets $6,183,643. The savings banks numbered 86 with a deposit of $72,515,468. The average income (during 1875) was 6.54 per cent, nearly all of which is paid to depositors, there being no capital stock. The management is very strictly controlled by law, and about three-quarters of the assets are lent on real estate in the State.

Fire and Marine Insurance. The whole number of fire and marine insurance companies doing business in the State in 1875 was 103, of which 30 were *C.* companies (11 stock and 19 mutual). The assets of these last were $17,851,915, of which over 16 millions were held by 10 companies (mostly in Hartford). The premiums received by *C.* companies from their entire business were $8,623,178, and corresponding losses, $3,431,171.

Life Insurance. The life and accident companies doing business numbered 21, of which 9 were *C.* companies; the assets of the last were $102,264,118. There were 2,109 life policies issued in Connecticut in 1878, insuring $2,592,190. The life premium paid amounted to $1,315,228. The policies in force in the State numbered 21,762 insuring $38,821,677.

Connecticut, a fire insurance Co. of Hartford, Conn., organized in 1850. *Statement* on Jan. 1, 1879: Capital stock paid up in cash, $1,000,000; net surplus, $180,943; total cap. and surplus, $1,180,943. Risks in force, $37,042,514; premiums, $426,348. Premiums received since the reorganization of the Co. $2,348,308; losses paid, $1,103,921; cash dividends paid to stockholders, $415. Cash dividends paid in 1878, $100,000.

Connecticut Central R R. Co., chartered in 1871. Main line (opened 1876) from East Hartford, Conn., to Springfield, Mass., and Melrose branch, 34.45 m. Offices in Hartford. *Financial statement:* Cap. stock, $437,000; bonds of 1st mortgage, due in 1895, interest 7% (April 1), $312,500. Net earnings for 1878, $14,189.

Connecticut General, a life insurance Co. of Hartford, Conn., organized in 1865. *Statement* on Jan. 1, 1879: Cap. stock paid up, $250,000; net assets, $1,333,311. Policies issued in 1878, 494, amounting to $613,503; premiums received, $194,380; paid for losses and matured endowments, $124,637. Policies remaining in force, 3,382, amounting to $5,453,609.

Connecticut Leaf, the trade name for a kind of tobacco first cultivated in the State of Connecticut, and much used for cigar wrappers.

Connecticut Mutual, a life insurance Co. of Hartford, Conn., organized in 1846. *Statement* on Jan. 1, 1879: Net or ledger assets, $46,225,182. Premiums received in 1878, $6,249,133; paid for losses and matured endowments, $3,407,593; new policies issued, 4,377, amounting to $8,914,400; total policies remaining in force, 64,979, amounting to $170,319,164. Real estate owned by the Co. in several cities, $7,515,066.

Connecticut Valley R R., from Hartford to Fenwick, Conn., 46.20 m. This Co. was chartered in 1868. Offices at Hartford. This road was opened by the Trustees of the 2d mortgage bondholders till Jan. 9, 1878, when it was surrendered to the Trustees of the 1st mortgage bondholders. *Financial Statement:* Cap. stock, $1,069,000; 1st mortgage bonds, $1,000,000; 2d mortgage bonds, $1,250,000. Cost of construction and equipments, $3,064,388. Net earnings for 1878, $22,597.

Connecticut Western R.R., from Hartford to Millerton, Conn., 69 m. This Co., chartered in 1868, is located at Hartford. *Financial Statement:* Cap. stock, $1,892,099; 1st mortgage bonds, due 1900, interest 7% (was paid to Jan. 1, 1876 only). Net earnings for 1878, $52,684.

Connecting-Rod, the rod which connects the piston-rod or cross-head of a locomotive engine with the crank of the driving-wheel axle. — Also the coupling-rod by which driving-wheels on the same side of a locomotive are connected.

Conossement [Ger.], a bill of lading.

Conquin, the fruit of a species of *Diospyros*; a jam is made of it in Natal.

Conservatoire, a public school of music in France.

Conservatory, a large glazed greenhouse for exotics.

Conserve [Fr.], a preserve; in pharmacy, a confection or electuary, a sweetened pulp containing the virtues of flowers, herbs, or fruits.

Consideration, a bonus or sum given on account or for any thing; the motive or material cause of a bargain or contract, expressed or implied.

Consign, to send goods to an agent or correspondent for sale.

Consignature, a joint signature.

Consignment is an expression employed to designate any transaction by which an individual in one place transmits or consigns goods to an individual in another place, to be at his disposal

under conditions expressed or implied. The person who transmits the goods is called the *consigner*, — he who receives them the *consignee*. Consigner and consignee are used by merchants to express generally the shipper of merchandise, and the person to whom they are addressed, by bill of lading or otherwise. The most ordinary description of *C.* is that to a commission merchant, who has to traffic with the goods for the use of his principal, and who may deal with third parties not warned of limitations to his power, as if he were the principal. Cargoes are sometimes consigned from debtors to creditors in satisfaction of debt, and sometimes as a fund of credit for advances, the consigner being entitled to draw on the consignee to a certain amount, or the latter advancing cash to the former. On failure of the consigner, the consignee has a lien on the goods in his hand for his advances.

Console, an elbow truss or projecting shoulder-piece; a bracket or support mostly fixed between two windows in a building; a small fancy side-table for a sitting-room with bracket-shaped projecting legs.

Consols [an abbreviation of *Consolidated annuities*], a familiar term used to denote the portion of the national debt of Great Britain forming the three per cent consolidated annuities. In the progress of the English national debt it was deemed expedient, on grounds which have been much questioned, instead of borrowing at various rates of interest, according to the state of the market or the need and credit of the government, to offer a fixed rate of interest, usually three or three and a half per cent, and, as the market required, to give the lenders an advantage in the principal funded. Thus subscribers of £100 would sometimes receive £150 of three per cent stock. In 1815, at the close of the French wars, a large loan was raised at as much as £174 three per cent and £10 four per cent stock for £100. The low rate of interest was thus purely nominal, while the principal of the debt was increased beyond all due proportion. This practice began in the reign of George II., when some portions of the debt on which the interest had been successfully reduced were consolidated into three per cent annuities, and consols, as the annuities were called, and other stocks of nominally low interest, rapidly increased under the same practice during the great wars. In times of peace, when the rate of money has enabled portions of the debt at a higher interest to be commuted into stock of lower interest, it has usually been into *C.* that the conversion has been effected. Temporary deficits of the revenue have been covered by an issue of *C.*; exchequer bills when funded have taken the same form, though not constantly or exclusively; and some loans of the Government in recent times for special purposes, such as the relief of the Irish famine and the expenditure in the Crimean war, have been wholly or partly raised in *C.* The consequence has been to give this stock a pre-eminence in the amount of the funded debt. It appears from a recent parliamentary return that of £773,313,229 ($3,866,566,145) of funded debt of Great Britain, £398,147,075 ($1,990,735,375) consisted of *C.*, £107,227,854 ($536,139,270) of three per cent reduced annuities, and £225,256,099 ($1,126,280,495) of new threes. The funds of the savings' banks have been applied to the absorption of reduced annuities and new threes in larger proportion than of *C.* The characteristics of this large portion of the debt, though it would seem almost indistinguishable from the three per cent reduced, which originated about the same period as the consolidated threes, are that the interest has never varied; no attempt has been made to convert it to a lower interest or into another form of stock; and not only from its larger amount than other stock is it most convenient to dealers, but from the great number and variety of its holders it is believed to express with the greatest nicety the state of monetary affairs. The price of *C.*, however, does not in ordinary times vary much. It has a tendency, indeed, to rise when all other securities are most shaken. In periods of panic and extreme pressure for money it has gone down for a few days between 80 and 90; its most customary range may be said to be 95 to 97; and it has occasionally touched par.

Consols-Market, the London Stock Exchange, where sales of public securities are transacted.

Consort, a partner. — A ship sailing with another.

Constantia. See CAPE WINES.

Constantinople. See TURKEY.

Constant White, a white coloring substance, — carbonate and sulphate of barytes.

Constructor, a builder.

Consul, an officer appointed by a government to reside in some foreign country for the purpose of facilitating and protecting the commerce of the citizens of such government. *C.* are not in general reckoned among diplomatic ministers; but in some particular cases (such as that of the *C.* sent to some of the semi-barbarous states of Africa), having diplomatic duties to perform, they are accredited and treated as ministers. France is distinguished among nations for an organization of trained *C.* who have intimate relations with the diplomatic corps. The establishment of *C.* is one of the most useful of modern commercial institutions. They were appointed about the twelfth century in the opulent states of Italy, such as Pisa, Lucca, Genoa, and Venice, and their origin has been ascribed to the necessity for extraordinary assistance in those branches of commerce formerly carried on with barbarous and uncivilized nations. The utility of such a mercantile officer has been perceived and felt by all trading nations. *C.* have been multiplied and sent to every part of the world where navigation and commerce can successfully penetrate; and their duties and privileges are now generally limited and defined by treaties of commerce, or by the statute regulations of the country which they represent. The right of sending *C.* to reside in foreign countries depends either upon a tacit or express convention. Hence their powers differ very widely in different states. In some they exercise a very extensive jurisdiction over the citizens of the state which appoints them; but the extent of this jurisdiction is not discretionary, and must, in all cases, be regulated either by an express convention between the state appointing and the state receiving the *C.*, or by custom. *C.* established in the U. States have no judicial power; and our government has rarely stipulated with other powers for much judicial authority for its *C.* The duties of a *C.*, even in the confined sense in which they are commonly understood, are important and multifarious. It is his business to be always on the spot, to watch over the commercial interests of the citizens of the state whose servant he is; to be ready to assist them with advice on all doubtful occasions; to see that the conditions in commercial treaties are properly observed; that those he is appointed to protect are subjected to no unnecessary or unjustifiable demands in conducting their business;

to represent their grievances to the authorities at the place where they reside; in a word, to exert himself to render the condition of the citizens of the country employing him, within the limits of his consulship, as comfortable, and their transactions as advantageous and secure, as possible. The laws of the U. States, on the subject of *C.* and vice-*C.*, especially authorize them to receive the protests of masters and others in relation to American commerce, and they declare that consular certificates under seal shall receive credit in the courts of the U. States. It is likewise made their duty, where the laws of the country permit, to administer the personal estates of American citizens dying within their consulates, and leaving no legal representative; and to take charge of and secure the effects of stranded American vessels in the absence of the master, owner, or consignee; and they are bound to provide for destitute seamen within their consulates, and to send them at the public expense to the U. States. It is made the duty of American *C.* and commercial agents to reclaim deserters and to discountenance insubordination, and to lend their aid to the local authorities for that purpose, and to discharge the seamen cruelly treated. It is also made the duty of masters of American vessels on arrival at a foreign port, to deposit their registers, sea-letters, and passports, with the *C.*, vice-*C.*, or commercial agent, if any, at the port. These particular powers and duties are in accordance with the usages of nations, and are not to be construed to the exclusion of others, resulting from the nature of the consular appointment. The doctrine of our courts is, that a foreign *C.*, duly recognized by our government, may assert and defend, as a competent party, the rights of property of the individuals of his nation in the courts of the U. States, and may institute suits for that purpose without any special authority from that party for whose benefit he acts. No nation is bound to receive a foreign *C.* unless it has agreed to do so by treaty, and the refusal is no violation of the peace and amity between the nations. *C.* are to be approved and admitted in the usual form; and if any *C.* be guilty of illegal or improper conduct, he is liable to have his *exequatur* (a written recognition of his character) revoked, and to be punished according to the laws of the country in which he is *C.*; or he may be sent back to his own country, at the discretion of the government which he has offended. Though the functions of a *C.* would seem to require that he should not be a subject of the state in which he resides, yet the practice of the maritime powers is quite lax on this point; and it is sometimes found useful, and thought most convenient, to appoint subjects of the foreign country to be *C.* at its ports. *C.* are entitled to privileges to a certain extent, such as for safe-conduct, but they do not enjoy the protection of the law of nations any more than other persons who enter the country under a safe-conduct. In civil and criminal cases they are equally subject to the laws of the country in which they reside. Consular privileges are much more extensive in Mohammedan countries, where they cannot be imprisoned for any cause whatever, except by demanding justice against them of the Porte, and they partake very considerably of the character of resident ministers. They are diplomatic agents under the name of *C.*, and enjoy the rights and privileges which the Ottoman Porte recognizes in relation to the foreign ministers resident at Constantinople. Considering the importance of the consular functions, and the activity which is required of them in all great maritime ports, and the approach which consuls make to the efficacy and dignity of diplomatic characters, it was a wise provision in the Constitution of the U. States, which gave to the Supreme Court original jurisdiction in all cases affecting *C.* as well as ambassadors and other public ministers; and the federal jurisdiction is understood to be exclusive of the state courts. — American *C.* are nominated by the President to the Senate, and by the Senate confirmed or rejected. Their powers and duties are described in the Regulation of Oct. 1, 1870, which permits them to transact business, or prohibits them from doing so, in certain places; fixes the rate of tariff of fees for consular services; forbids consular officers to be absent from their posts, or to hold correspondence in regard to the public affairs of any foreign government with the press, or private persons, or otherwise than with the proper officers of the U. States; forbids consular officers being pecuniarily interested in the receipt or disbursement of the wages of seamen, or in expenditures made for their relief or transportation; provides that no compensation shall be paid to consular officers, unless they shall be citizens of the United States; requires all consular officers to send annually to the Secretary of State a return of the trade at the ports within their consulate, etc.

By the law of the U. States the consular officers are classified under the names of *consuls-general, consuls, vice-consuls, deputy-consuls, commercial agents, vice-commercial agents,* and *consular agents.* It is provided, that these official designations shall be deemed to have the respective meanings therein assigned to them, namely: *C.*-general, *C.*, and commercial agent, shall be taken to denote full, principal, and permanent consular officers, as distinguished from subordinates and substitutes; deputy-*C.* and consular agent to denote consular officers subordinate to such principals, exercising the powers and performing the duties within the limits of their consulates or commercial agencies respectively, — the former at the same ports or places, and the latter at ports or places different from those at which such principals are located respectively; and vice-*C.* and vice-commercial agents to denote consular officers who shall be substituted, temporarily, to fill the places of *C.*-general, *C.*, or commercial agents, when they shall be temporarily absent or relieved from duty; and the term *consular officer* to include all such officers as are mentioned above, and none others.

The statutes of the U. States classify the Consulates-General, Consulates, and Commercial Agencies into three classes: — 1. Those embraced in a schedule known as Schedule B, the incumbents of which receive a fixed salary, and are not allowed to transact business. 2 Those embraced in a schedule known as Schedule C, the incumbents of which receive a fixed salary, and are allowed to transact business. 3. All other Consulates, the incumbents of which are compensated by the fees collected in their offices, and are allowed to transact business. Under the Act of June 11, 1874, the Consulates in Schedules B and C are subdivided into seven classes, according to salary, Schedule C embracing all of Class 7. The classification is indicated by the number annexed to each Consulate.

SCHEDULE B. (CLASS 1.)

CONSULATES-GENERAL.	Montreal.	5. Amoor River.
	Paris.	2 Amoy
	Rio Janeiro.	6. Amsterdam.
Berlin.	Rome	4. Antwerp.
Cairo.	Shanghai.	3. Aspinwall.
Calcutta.	St. Petersburg.	6. Aukland.
Constantinople	Tampico.	6. Bahia.
Frankfort-on-the-Main.	Vienna.	3 Bangkok.
Havana.		6. Barbadoes.
Kanagawa.	CONSULATES.	6. Barcelona.
London.	6. Acapulco.	5 Barmen.
Melbourne.	5. Aix-la-Chapelle.	5. Basle.
Mexico.	6. Algiers.	5. Beirut.

CONSULATES. — *Continued.*

4. Belfast.	6. Jerusalem. [ca	5. Prague.
6. Bermuda.	5. Kingston, Jami-	6. Prescott.
4. Birmingham.	6. Kingston, Canada.	6. Quebec.
4. Bordeaux.	6. La Rochelle.	5. Rotterdam.
3. Bradford.	6. Laguayra.	6. San Domingo.
4. Bremen.	5. Leeds.	5. San Juan, Porto
6. Bristol.	6. Leghorn.	[Rico.
4. Brussels.	5. Leipsic.	4. Santiago de Cuba.
3. Buenos Ayres.	5 Leith.	6. Santa Cruz, West
6. Cadiz.	6. Liege.	[Indies.
2. Callao.	5. Lisbon.	6. Seychelles.
2. Canton.	*Liverpool.	4. Sheffield.
6. Cape Town.	4. Lyons.	4 Singapore.
5. Cardiff.	6. Mahé.	5. Smyrna.
6. Charlottetown,	6. Malaga.	5. Sonneberg.
[Pr. Eds. I.	6. Malta.	5. Southampton.
5. Chemnitz.	3. Manchester.	6. St. Helena. [da.
2. Chin-Kiang.	6. Manheim.	6. St. John's, Cana-
6. Clifton.	4 Marseilles.	5. St. John, N. B.
5. Coaticook.	6. Martinique.	4. St. Thomas.
3. Colon.	5. Matamoras.	6. Stuttgart.
6. Copenhagen.	3. Matanzas.	2. Swatow.
5. Cork.	5. Mauritius.	5. Tamatave.
3. Demerara.	6. Messina.	6. Tampico.
4. Dresden.	5. Montevideo.	3. Tangiers.
5. Dublin.	6. Munich.	2. Tien-Tsin.
5. Dundee.	3. Nagasaki.	5. Toronto.
6. Fayal, Azores.	6. Nantes.	5. Trieste
6. Florence.	6. Naples. [idence.	4. Trinidad de Cuba.
2. Foo-Choo.	5. Nassau, NewProv-	3. Tripoli.
6 Fort Erie.	6 Newcastle.	3 Tunis.
6. Funchal.	6. Nice, France.	4. Tunstall.
6. Geneva.	2. Ningpo.	5. Turk's Island.
6. Genoa.	5. Nuremberg.	6. Valencia.
6. Gibraltar.	5. Odessa.	3. Valparaiso.
3 Glasgow.	6. Oporto.	3. Vera Cruz
6. Goderich, Canada.	3. Osako.	6. Verviers. [West.
4. Hakodadi.	6. Palermo.	6. Windsor, Canada
5. Halifax.	3. Panama.	6. Winnipeg, B.N.A.
4. Hamburg. [da	5. Pernambuco.	5. Zurich.
5. Hamilton, Cana-	6. Pictou. [ritius.	
2. Hankow.	5. Port Louis, Mau-	COMMERCIAL AGENCIES.
3. Havre.	6. Port Mahon.	
3. Hiogo.	6. Port Said.	
1. Honolulu.	6. Port Sarnia.	Madagascar.
1. Hong-Kong.	6. Port Stanley.	San Juan del Norte.

* The consulate at Liverpool, as to salary, specially provided for.

SCHEDULE C. (CLASS 2.)

CONSULATES.	7. Maranham.	7. Truxillo.
	7. Milan.	7. Venice. [Scotia).
7. Apia.	7. Omoa.	7. Windsor (Nova
7. Batavia.	7. Ovalau.	7. Zanzibar.
7. Bucharest.	7. Para. [Sul.	
7. Cape Haytien.	7. Rio Grande de	COMMERCIAL AGENCIES.
7. Ceylon.	7. Sabanilla	
7. Cyprus.	7. Santiago (Cape	
7. Gaspe Basin.	7. Stettin. [Verde).	Gaboon.
7. Guayaquil.	7 Tahiti.	Lanthala.
7. Guaymas.	7. Talcahuano.	St. Paul de Loando

CLASS 3.

CONSULATES.	Corunna.	Monterey.
Aguas Calientes.	Curaçoa.	Moscow
Alicante.	Denia.	Mozambique.
Amapala.	Falmouth.	New Chwang.
Ancona.	Galatza.	Ostend.
Archangel.	Ghent.	Padang
Bathurst.	Gottenburg.	Paramaribo.
Bergen.	Guadeloupe.	Plymouth.
Bilbao.	Guatemala.	Puerto Cabello.
Bogota.	Hamilton (Bermuda).	Reims.
Bombay.	Helsingfors.	Rio Hacha.
Brunswick.	Hobart Town.	Rosario.
Buenaventura.	Laguna.	San Blas.
Carlsruhe.	Lambayeque	San Dimas. [ca).
Carrara.	La Paz (Bolivia).	San Jose (Costa Ri-
Carthagena (Spain).	La Paz (Mexico).	San Jose and Cape
Cayenne.	La Union.	Saint Lucas.
Chee-Foo.	Londonderry.	San Salvador.
Chihuahua.	Ludwigshafen.	Sonsonate
Christiana.	Manila.	Santa Martha.
Ciudad Bolivar.	Magdalena.	Santander.
Comayagua and Te-	Manzanillo (Mexico).	Seville.
gucigalpa.	Maracaibo.	Sierra Leone.
Coquimbo.	Mazatlan.	St. Bartholomew.
Cordoba.	Merida.	St. Catherine's Is-
	Minatitlan.	land

CLASS 3. — *Continued.*

St. Christopher.	Zacatecas.	Oajaca.
St. John (Newfound-	Zante.	Piedras Negras.
St. Martin. [land).		Presidio del Norte.
St. Pierre (Marti-	COMMERCIAL AGENCIES.	Samana.
St. Thome. [nique).		San Andres.
Stockholm.	Antigua.	San Luis Potosi.
Taranto.	Belize.	St. Bartholomew.
Tehuantepec.	Camargo	St. Christopher.
Teneriffe	Grand Bassa.	St. Marc. [lon).
Trebisond.	Guerrero.	St. Pierre (Mique-
Trinidad (Island).	Medellin.	Sydney.
Victoria.	Mier.	Tetuan.
Warsaw	Nuevo Laredo.	

Consumption, a using up; the quantity consumed, or to be consumed, as when goods are withdrawn from a bonded warehouse *for consumption.*

Contango, a stock exchange term, signifying a sum of money paid for accommodating either a buyer or seller by carrying the engagement to pay money or deliver shares over to the next account-day.

Contents, what is contained in bales, casks, or packages of merchandise.

Contest, to dispute or litigate.

Continental, a fire insurance Co. of New York City, organized in 1853. Statement on Jan. 1, 1879: Capital stock paid up in cash, $1,000,-000; net surplus, $1,038,422; total cap. and surplus, $2,038,422. Risks in force, $255,360,875; premiums, $2,020,110. Premiums received since the organization of the Co., $19,004,567; losses paid, $10,118,110; cash dividends paid to stockholders, $3,014,497. Cash dividends paid in 1878, $134,176.

Continental, a life insurance Co. of Hartford, Conn., organized in 1864. Statement on Jan. 1, 1879: Capital stock paid up in cash, $300,000; net assets, $2,681,373. Policies issued in 1878, 559, amounting to $315,737; premiums received, $429,-966; paid for losses, matured endowments, and surrendered policies, $324,996. Policies remaining in force, 8,798, amounting to $9,284,720.

Contingent, a share or portion arising from an adventure or partnership in trade; the quota which each is to furnish or receive.

Continuation, a connection; the carrying over of stock, etc., by a stock broker or dealer.

Conto, a Portuguese word for million; a conto of reis (1000 milreis) is usually expressed thus, 1000 $000; and is worth about $562.50.

Contra [Lat.], on the other side. *Per contra* in commercial phraseology means a credit or writing-off on the opposite page.

Contraband, from the Italian *contrabando*, contrary to proclamation, is applied in one sense to the goods which are prohibited to be exported or imported, on the ground of theories regarding national policy, or protection of home produce. When goods or effects are smuggled in, or put on the market without payment of the customs or excise duty to which they are subject, they are *C.*, and are, on seizure, liable to be forfeited. *C. of war* is applied by belligerent powers to the furnishing of arms, provisions, and other assistance to powers with which they are at war, by neutral states, or their own subjects. See NEUTRALITY.

Contract, a covenant or agreement between parties for a lawful consideration as in the case of a sale, the acceptance of a tender for the supply of goods or work to be executed, letting, etc. See AGREEMENT, CHARTER PARTY, etc.

Contractor, one who contracts; one of the

parties to a covenant or bargain; an undertaker of work upon contract.

Contrate-Wheel. See FACE-WHEEL.

Contrayerva, a South American plant, the *Dorstenia contrayerva;* the rhizoma are stimulant, sudorific, and tonic, also emetic. It has a Spanish reputation for being an antidote to poisons.

Contrebandier [Fr.], a smuggler.

Contrefaçon, Contrefaction, the French term for pirating or counterfeiting.

Contribution, a joint payment of money to an undertaking; the individual proportion of a general average.

Contributory, one called upon to pay in his share to the common stock, as a call in the winding up of a company.

Controle, a French term applied to stamped silver or gold.

Conversation-Tube, a conducting elastic pipe for conveying sound or for delivering messages to distant parts of a building. At one end is a mouth-pipe about two inches in diameter, and at the other end an ear-piece. The neck, which is a yard or more in length, is made of spiral wire covered with india-rubber and overspun with mohair or silk.

Convertible-Carriage, a vehicle which can be used either open or closed.

Converting-Furnace, a furnace used for converting wrought-iron into steel; a cementing furnace. See CEMENTATION.

Conveyance, the transport of goods or passengers by land or sea.

Conveyor, a name for various mechanical contrivances for carrying objects; but more usually applied to adaptations of spirals or band-buckets, which convey grain, flour, etc., in elevators, thrashers, and grinding-mills.

Convoy, a term applied, in the law of shipping, to a naval force appointed by the government for the protection of vessels flying between certain ports in time of war. Individuals have not always been left to themselves to judge as to the expediency of sailing with or without *C.* The governments of most maritime states have thought proper, when they were engaged in hostilities, to oblige their subjects to place themselves under an escort of this sort, that an enemy might not be enriched by their capture. It is very common, during periods of war, to make *sailing or departing with C.* a condition in policies of insurance. This, like other warranties in a policy, must be *strictly* performed. And if a ship warranted to sail with *C.* sail without it, the policy becomes void, whether this be imputable to any negligence on the part of the insured, or the refusal of government to appoint a *C.* There are five things essential to sailing with *C.*: viz. *first*, it must be with a regular *C.*, under an officer appointed by government; *secondly*, it must be from the place of rendezvous appointed by government; *thirdly*, it must be a *C.* for the voyage; *fourthly*, the master of the ship must have sailing instructions from the commanding officer of the *C.*; and *fifthly*, the ship must depart and continue with the *C.* till the end of the voyage unless separated by necessity.

Cooking-Accounts, a term applied to falsely represented accounts; statements prepared for deceptive purposes.

Cooking-Range, a cooking arrangement in which the devices — grate, oven, boiler, etc. — are placed in a row (range), and set in brickwork within the fireplace, so called. Portable ranges are not so built in, but are cooking-stoves. A *Cooking-Stove*, usually built of iron, contains a fuel-chamber and ovens, with holes into which pots may be set to boil the contents. Stoves are comparatively uncommon in England, where the open fireplace for apartments and the range for kitchens are preferred. — *E. H. Knight.*

Cooking-Stove. See COOKING RANGE.

Cool, a tub cut in two, in which butter is sometimes sent to market by farmers.

Cooler, in the West Indies, a flat wooden receiver for cane juice after boiling to settle and granulate. A vessel used in breweries and distilleries to cool the wort in. The name is also frequently applied to an ice-chest. See REFRIGERATOR.

Coolie, an Asiatic laborer not belonging to the skilled or artisan class. Of late, however, the word is almost exclusively used to designate those natives of China, India, etc., who leave their native country under contracts of service to work as field-hands or laborers in foreign plantations and elsewhere. The organization, partly official and partly voluntary, by means of which these Eastern laborers are collected, engaged, and conveyed to their respective destinations, has, within recent times, developed itself into a regular trade. The first recognition of the traffic was in 1844, when the British colony of Guiana made provision for the encouragement of Chinese immigration. About the same time the Peruvian planters, who since their separation from the mother country had restricted slavery within the narrowest limits, also looked to China as being likely to furnish an efficient substitute for the negro bondsman. Agents armed with consular commissions from Peru began to appear in Chinese ports, where they collected and sent away ship-loads of *C.* Each one was bound to serve the Peruvian planter to whom he might be assigned for 7 or 8 years, at fixed wages, generally about $4.25 a month, — food, clothes, and lodging being provided. Cuba, profiting by the example of Peru, also engaged in the traffic. From 1847 to 1856 the trade went on briskly without attracting much notice. Gradually, however, ugly reports as to the treatment the *C.* received, both on their voyage to and after their arrival in Peru and Cuba, began to attract general attention; and still more painful rumors were set afloat regarding the thievish devices used to induce Chinese emigrants to leave their native land. In March, 1866, the representatives of the governments of France, England, and China drew up a convention enacting that every *C.* must at the end of a five years' engagement have his return passage-money paid to him. The West Indian colonies at once objected to this. They wanted permanent, not temporary settlers. They could not afford to burden the *C.*'s expensive contract with return-money, so they declined to accept immigrants on these terms. Thus a legalized *C.* trade between the West Indies and China was extinguished. In the U. States the *C. trade*, so called, is forbidden under penalties of forfeiture and imprisonment by laws of Feb. 19, 1862, and March 3, 1875 (*Revised Statutes, Sect.* 2158 – 2161), and the Oriental immigration is regularized by the following section of the same laws: —

Sect. 2162. Nothing herein contained shall be deemed to apply to any voluntary emigration of the subjects of China, Japan, or of any other Oriental country, or to any vessel carrying such person as passenger on board the same, but a certificate shall be prepared and signed by the consul or consular agent of the U. States residing at the port from which such vessel may take her departure, containing the name of such person, and setting forth the fact of his voluntary emigration from such port, which certificate shall be given to the master of such vessel; and the same shall not be given until such consul or con-

sular agent is first personally satisfied by evidence of the truth of the facts therein contained.— *Sect.* 2163. The President is empowered, in such way and at such time as he may judge proper, to direct the vessels of the U. States, and the masters and commanders thereof, to examine all vessels navigated or owned in whole or in part by citizens of the U. States, whenever in the judgment of such master or commanding officer reasonable cause exists to believe that such vessel has on board any subject of China, Japan, or other Oriental country, known as "*C.*"; and upon sufficient proof that such vessel is employed in violation of the preceding provisions, to cause her to be carried, with her officers and crew, into any port or district within the U States, and delivered to the marshal of such district, to be held and disposed of according to law. — *Sect.* 2164. No tax or charge shall be imposed or enforced by any State upon any person immigrating thereto from a foreign country, which is not equally imposed and enforced upon every person immigrating to such State from any other foreign country.

Cooling Apparatus. See REFRIGERATOR and FREEZING MACHINE.

Coom, a term for soot, smoke-black, coal-dust, and other similar refuse matters; also the mould which forms on certain liquids, the matter that works out of the reaves or boxes of carriage-wheels, etc.

Coomb, an English grain-measure containing 4 bushels.

Coomie, an extensive present in the shape of customs duty, demanded by the king and chiefs from supercargoes in the Bonny and other rivers of W. Africa for permission to trade with the natives.

Coon, an abbreviated name for the racoon.

Coop, a wooden pen for poultry on board ships.

Cooper, one who makes casks, barrels, &c., with staves bound by hoops (see COOPERING); name in London for a mixture of stout and porter.

Cooperage, money paid to a cooper for repairing casks, opening them for sampling, etc.

Coopering, the art of making vats, backs, tuns, casks, and barrels. Technically, a *wet* or *tight* cooper makes the vessels intended to hold liquids; the *dry* cooper makes the looser and cheaper work for holding dry goods; while the *white* cooper makes churns and other kinds of highly-finished work. Wet or tight work is made of oak; many other kinds of wood are employed for inferior cooperage. The *staves*, being curved both in length and in width, are the most difficult parts of a cash to produce. To insure accuracy of workmanship, *cask-making machinery* has been invented to fashion all the pieces with undeviating accuracy; but the handwork system is still the one most usually adopted. The largest and strongest examples of coopers' work are the enormous vats and backs used by brewers.

Co-operation, in its specific and technical sense, implies the association of any number of individuals or societies for mutual profit, whether in the purchase and distribution of commodities for consumption, or in the production of commodities, or in the borrowing and lending of capital among workmen. The most powerful co-operative force in the individual system is what economists have termed "the division of labor;" but that is really also a union and graduation of labor towards productive ends, and has its counterpart in the multiform divisions of capital in its application to maintenance and extension of industry. *C.*, as technically understood, occupies a middle position between the doctrines of the communists and socialists on the one hand, and the private property and freedom of individual labor and enterprise on the other. It takes its departure from communism at a very definite and significant point. While the latter would extinguish the motive of individual gain and possession in the sentiment of a universal happiness or good, and remodel all the existing rights, laws, and arrangements of society on a basis deemed consonant to this end, *C.* seeks, in consistency with the fundamental institutes of society as hitherto developed, to ameliorate the social condition by a concurrence of increasing numbers of associates in a common interest. The co-operative societies, springing from this idea, though attended with the most varied fortune, have greatly increased in number and in amount of business in recent years in Europe. The form, particular objects, and organic rules of these associations are by no means uniform. But as we find them in the principal countries of Europe, they may be divided into three general classes:— 1. *Societies of Consumption*, the object of which is to buy and sell to members alone, or to members and non-members under differing conditions, the necessaries of life or the raw materials of their industry; 2. *Societies of Production*, the object of which is to sell the collective or individual work of the members; 3. *Credit-unions*, or societies of credit or banking, the object of which is to open accounts of credit with their members, and advance them loans for industrial purposes. There are numerous modifications of the principle, such as friendly societies, burial societies, societies of workmen which undertake the execution of work by contract, arrangements of private firms by which the workmen share in the profits of the employers, and building societies, now rife in most large towns in this country, the object of which is to enable members to become owners of dwelling-houses. But the above three categories define the distinguishing characteristics of the co-operative society proper; and it is somewhat remarkable that the three kinds of association have attained marked success in three different European countries. England stands at the head in societies of consumption; France, in societies of production; Germany, in societies of credit. With reference to this variety of result, it may be observed that the social equality resulting from the great Revolution, in connection with the character of much of the manufacturing industry of France, has given that country a larger number of artisans who work in their own houses, and have a passion for independence in their handicraft, than is to be found in any other country. On the other hand, the masses of operatives in the factories and other great works of England, while retaining their position as wage-earners, have put forth most energy and attained their highest co-operative success in societies for the purchase, and in some degree the production, of their own immediate necessaries of life. The less abundant capital, and the want of banks and other institutions of credit in the smaller towns and remoter parts of Germany, may explain in some measure the notable development of societies of credit in that country. But no account of the phenomena in Germany would be satisfactory without placing at the head of influences the personal agency of one man,—M. Schulze, of Delitzsch (a town of only 6,000 inhabitants),—who had the sagacity to perceive that societies of credit were the necessary foundation of the co-operative system, and who reasoned out principles, planned, and labored with a skill, disinterestedness, and perseverance which have crowned his idea with remarkable success. The Credit Society of M. Schulze is practically a bank, but a bank organized on principles specially adapted to the working classes within certain limits of transaction, to which it

is strictly confined. The members of the society must be men of "self-help," able to work and in regular employment, and they must hold each one equal share of the stock capital of the society, which may be paid up in full, or by regular instalment. Dividends are only paid to the members who have paid in full, the profits due on the partly-paid shares being added to these till they reach their full amount. It follows from the principle of the society, — "in proportion to the chance of gain the risk of loss," — that when the share-capital has to be called upon to liquidate the debts, it is the capital actually paid in that loses. Equality of shares and equality of advantages and risks are thus attained. But in addition to the share-capital there is a reserve fund formed out of entrance fees and a percentage of the net profits. The order of liability for deficits in the balance-sheets is thus, (1) reserve fund, (2) paid-in capital, and (3) private property of the members, — the final principle being that of unlimited liability. Every member is responsible for the debts of the society, and the society for the debts of every member. It is obvious that a company thus constituted, and composed of the most saving and industrious workmen of a town or district, offers a solid security, and consequently the share-capital is supplemented by loans for given periods of time, debentures, and savings deposits, the last having to be guarded by conditions as to notice of withdrawal. At the beginning of a society the paid-up share-capital may not be more than the proportion of 10 to 90 of borrowed funds, but it has to be brought up as rapidly as possible to 25 per cent, and should reach a maximum of 50 per cent. The share-capital, as originally fixed, has also to be increased as the business, and the amount of funds necessary for its transaction, increase; so that the amount of each share has thus to be supplemented *plus* the increase of business *minus* the increase of members. By these means the society is protected from too small a share-capital for its liabilities, and from the temptation of appropriating large dividends out of the surplus profit, accruing from borrowed funds. Another peculiarity of the German credit-union is that it makes advances of the funds of which it is possessed to its own members only. The two great ends to be secured being the minimum of risk and the maximum of responsibility, the first is promoted by advancing money only for industrial purposes, within due limits, among borrowers whose requirements and circumstances are or may be thoroughly known to the society, and the second by the fact that every member of the society is unlimitedly liable for any errors or losses that may arise in the administration. The advances are made in the usual forms of promissory notes with the indorsation of sureties, ordinary bills of exchange, and occasionally mortgages over real property in current accounts. Advances are not made for longer periods than the society can itself borrow; partial repayment at dates is sometimes conditioned within the period of advance; and the interest charged follows the public money-market rate. It is thus that M. Schulze, through a series of skilful regulations beyond our space to follow, solved the problem, which vexed and puzzled the socialists of a past generation, of bringing capital direct to the workman or "immediate producer." When the little credit-union of Delitzsch was fully organized in 1852, popular opinion was so well prepared and enlightened on the subject by M. Schulze's efforts in the Prussian Congress and on the platform, that similar societies were rapidly organized in other parts of the country. While each society had full powers of self-regulation, they were all much on the Delitzsch model, and a general affiliation was brought about for mutual counsel and encouragement. In 1865, he established a central credit bank at Berlin, by which the societies, while depending mainly on local credit supplies, might have access, in case of need, to the general loan market. The credit-unions, though now numerous, are only a section of the co-operative movement in Germany. The law of the Prussian Congress granting corporate rights to loan and credit associations extends the same privileges to "raw material and store unions," "unions for the production and sale of finished wares on a common account," "unions for the purchase of the necessaries of life wholesale and the selling of them retail," and "unions for providing their members with dwelling-houses." — The history of the co operative movement in France is much too extensive to be traced here. The *society of production*, of which there are at least forty examples in Paris alone, is found in nearly all the French provinces, and has proved the capacity of workmen by union to carve out business for themselves and be their own masters, while, in many cases, employing other workmen or auxiliaries at wages, who have no share in the profits. There are also in France more examples, probably, than in any other country, of workmen sharing in the profits of the firms by which they are employed, under arrangements offered and regulated by the employers or capitalists themselves. — Of the *society of consumption* there are innumerable examples in Great Britain, the chief being the Rochdale, Leeds, and Halifax societies, embracing nearly the whole working population of a large manufacturing district, and carrying out their operations, from the wholesale and retail stores to dairies, flour-mills, and other auxiliary branches, including libraries and news-rooms. The supply associations in London organized by members of the government civil service have also attained much importance; but, as these trade with the public, and divide large profits among privileged holders of shares, it has been questioned whether they can be properly regarded as co operative societies. Nearly every town of the kingdom has a *co-operative store*; and when these are numerous in a district they usually affiliate, and open a common wholesale department in Liverpool, Glasgow, or some other emporium. The advantages in many cases may not be great, and after a brief existence the societies not unfrequently wind up. But when properly conducted and supported, they secure wholesome commodities, encourage among their members ready-money payments, and as the goods are sold at a fair margin of profit, there is every quarter or half year a dividend at the rate of 5 to 10 or more per cent to the members on their share-capital, and a bonus to non-members on the amount of their purchases. One of the indirect advantages of the co-operative store, when established in a community, is its influence as a formidable rival on private grocers and dealers. The numerous cotton factories in Lancashire, England, on a basis of small joint-stock shares, yielding in some cases large dividends, might almost be considered as great an example of co-operative production as any effort of the kind in France. The operatives have a large stake and much advantage in these factories; but since the spinner or weaver does not necessarily work in the factory of which he has a small proprietary share, these joint-stock

establishments are probably to be regarded more as investments of the savings of operatives than as co-operative societies. The co-operative idea, as would probably be held by its most stanch propounders, requires identity of purpose and interest, with community of advantages and risks, though not necessarily absolute equality or uniformity of individual relation, among the co-operatives. When the association passes into a mere investment and trading company, the idea would seem to be lost. Down to this day the *C.* system has not been received with marked favor in the U. States. Many co-operative stores have been established in almost all parts of the country; but, excepting Massachusetts, where their management seems to be better understood, relatively few of them have met with a decided and durable success. — *R. Somers.*

Cop, Coppin, in spinning, a conical ball of thread or yarn formed on a spindle.

Copaiba, or **Copaiva** [Fr. *baume de copahu;* Ger. *Kopaiva balsam;* Sp. *copayva*], commonly called a balsam, but properly an oleo-resin or turpentine,

Fig. 100. — Copaifera officinalis.

is a drug obtained from the *Copaifera officinalis* (Fig. 100), a native of South America, and from other species of the same tree. Two kinds are sometimes distinguished, and named from the countries in which they are produced, the Brazilian (chiefly from the province of Para), and the West Indian. The former is thin, clear, of a pale color, pleasant aromatic smell, and of an acrid bitter taste; while the latter is thick, golden yellow, not transparent, and of less agreeable smell, even resembling turpentine. Sp. gr. .980. It is often adulterated with castor-oil and the finer sorts of turpentines. When good it should be completely soluble in alcohol of the strength of 90 per cent; but the simplest test of its purity is to heat a small quantity in a watch-glass, when, if good, a hard brittle resin remains. This drug is celebrated for its action as a stimulant to the mucous surfaces. Numerous preparations of this article are sold under under such names as *soluble C.*, *specific solution*, *salt of C.*, etc.; none of these appear to possess equal activity and certainty of operation to the natural balsam. As the whole virtue of *C.* as a medicine depends on the essential oil it contains, the value of any of these preparations may be estimated by the quantity of that article which is found in them. In the case of the first two articles above named the quantity is very small indeed, and in the last it is wholly deficient. *Imp.* free.

Copal, a valuable and peculiar kind of resin (improperly called Gum *C.*), that naturally exudes from a large tree (*Rhus copallinum*) found in various tropical countries. It is imported from Africa, the Philippine Islands, Sierra Leone, Portugal, and Bombay. The best *C.* is hard and brittle, in rounded lumps of a moderate size, easily reducible to a fine powder, of a light lemon yellow color, beautifully transparent, but often, like amber, containing parts of insects and other small extraneous bodies in its substance. Sp. gr. from 1.045 to 1.139. It has neither the solubility in water common to gums, nor the solubility in alcohol common to resins, at least in any considerable degree. It may be dissolved by digestion in drying linseed oil, and other volatile menstrua. This solution forms a beautiful transparent varnish, which, when properly applied and slowly dried, is very hard and very durable. *C. varnish* was first discovered in France, and was long known by the name of *vernis martin.* It is applied to snuff-boxes, tea-boards, and other utensils. It preserves and gives lustre to paintings; and contributes to restore the decayed colors of old pictures, by filling up cracks, and rendering the surface capable of reflecting light more uniformly. *C.* is liable to be confounded with *gum animé*, when the latter is very clear and good. But it is of importance to distinguish between them, as the animé, though valuable as a varnish, is much less so than the finest *C.*; the varnish with the former being darker colored, and not so hard. Besides the external appearance of each, which is pretty distinct to a practised eye, the solubility in alcohol furnishes a useful test, — the animé being readily soluble in this fluid, while the *C.* is hardly affected by it; *C.* is also brittle between the teeth, whereas animé softens in the mouth. *C.* is also dug from the earth on the coast of Africa, a few miles inland, opposite the island of Zanzibar. The supply is supposed to be inexhaustible, and the production only limited by the indolence of the negroes, who will merely dig up enough to supply their daily wants. *Imp.* free.

Copalche Bark, an aromatic bitter medicinal bark, the produce of *Croton pseudochina*, a Mexican bark.

Copal-Varnish. See Copal.

Copang, a money of account and weight in some parts of the Eastern Archipelago; the fourth part of a mace. In Sumatra the *C.* is 2½ grains, in other parts 7 to 10 grains.

Copartner, one who is united in partnership with another.

Cope, the most magnificent vestment of Catholic priests. In form it is a semicircle, without sleeves, and with a hood. It is fastened across the breast with a clasp or morse, and is ornamented with embroidery, and even with jewels. — The outer part or case of a large loam mould, used in casting metals. — To cope, is to barter or change away.

Copeck, Kopeck, a Russian copper coin, the hundredth part of the rouble, worth about ¾ of a cent. The coined copper money is in pieces of 10, 5, 2, 1, and half *C.* There are silver pieces current of 5, 10, 15, 20, 25, 30, 50, 75, and 150 *C.*

Copeman, a merchant; one who barters.

Copenhagen. See DENMARK.

Coper, in lead-mining, one who contracts to get ore at an agreed sum per dish or load, etc.

Copey, a dye-wood, obtained in Cuba from *Clusia rosea.*

Cop-House, a place where tools are kept.

Coping, the upper course of masonry on a wall or parapet, etc., which forms a projecting or covering course.

Coping-Stones, long plats of stone laid on a wall, and projecting a few inches beyond the wall to carry off rain.

Copper [Dutch, *koper;* Fr. *cuivre;* Ger. *Kupfer;* It. *rame;* Port. and Sp. *cobre*], a metal of a beautiful red color, and considerable lustre. Its taste is styptic and nauseous; and the hands, when rubbed for some time on it, acquire a peculiar and disagreeable odor. It is harder than silver; its sp. gr. varies according to its state, being, when quite pure, near 9.000. Its malleability is great; it may be hammered out into leaves so thin as to be blown about by the slightest breeze. Its ductility is also considerable. Its tenacity is so great, that a *C.* wire 0.078 of an inch in diameter is capable of supporting 302.26 lbs. avoirdupois without breaking. Its liability to oxidation from exposure to air or damp is its greatest defect. The rust with which it is then covered is known by the name of verdigris, and is one of the most active poisons. *C.* is found in the metallic state in nature, sometimes in very great masses, as on the south shores of Lake Superior, where pieces of 150 tons weight have sometimes been obtained. The great source of its supply is an ore in which the metal is found combined with sulphur. In both states it is obtained in almost every mineral district in the world, in beds, or more commonly in veins in primitive and secondary mountains, accompanied by several other mineral substances. *C.* is found in many parts of the U. States; but the *C.* region of Lake Superior contains the mines which, hitherto, have been the most profitably worked in this country, their product being about 3,000 tons annually. In a commercial point of view, the *C.* mines of Cornwall (England), Lake Superior (U. States), Chili, Cuba, Spain, and Australia are by far the most important. Several salts of *C.* possess considerable industrial value, chiefly for the formation of blue and green pigments, in dyeing and calico-printing, and for the deposition of metallic *C.* by electro-metallurgy. The principal salts of *C.* are the *acetate* (see VERDIGRIS), the *carbonate* (see VERDITER), and the *sulphate* (see VITRIOL). *C.* unites with facility with almost all other metals, and a large number of its compounds are of the highest importance in the arts. Indeed *C.* is much more important and valuable as a constituent element in numerous alloys than it is as pure metal. For the principal alloys in which it forms a leading ingredient, see BELL-METAL, BRASS, BRONZE, GERMAN-SILVER, PINCHBECK, etc. The foreign *C.* trade of the U. States for the year 1878 was as follows: *C.* ore, *Exp.* to England and Germany, 32,947 cwt., valued at $169,020; *Imp.* 7,838 cwt., valued at $84,359; *C.* in pigs, bars, and sheets, *Exp.* 11,297,870 lbs., valued at $2,102,455; *Imp.* 370,598 lbs., valued at $49,100; Manuf. *C.*, value of *Exp.* $217,446; of *Imp.* $322,418.

Imp. duty: Copper-ore, on all fine copper contained therein . . . . . 3 cents per lb.
" " old, taken from the bottom of American vessels compelled by marine disaster to repair in foreign ports Free.
" " old, fit for manufacture only . . . . 4 cents per lb.
" " pigs, bars, ingots, or plates, 5 cents per lb.
" " braziers' sheets (rolled plates) . . . . 45 per cent.
" Copper, other sheets . . . . 45 per cent.
" " bolts, nails, spikes, rods, etc. . . . . 45 per cent.
" " bottoms (still bottoms) . . . . 45 per cent.
" " manufactures, n. o. p. of copper, or of which copper is component of chief value . . . . 45 per cent.
" " regulus of, and black or coarse . . . . 4 cents per lb.
" " sheathing, 48 inches long, 14 inches wide, weight from 14 to 34 ounces per square foot . . . . . . 45 per cent.
" " sulphate of (blue vitriol) . 4 cents per lb.
" " chafing-dishes . . . . 45 per cent.

C.-smelting. The mixture of ores, being selected as noticed under ORE-DRESSING, is wheeled (Fig. 101) to a tramway, *t*, situated over the *roasting* or *calcining furnaces*, and the charge is thrown into two large hoppers of plate-iron, H H; these are closed at the bottom by means of a plate, on withdrawing which the charge falls upon the sole of the furnace, *s*, composed of bricks. The vault of the furnace descends by a rapid slope from the fire to C, the entrance of the flue, *f*. Two sides of the furnace contain each two doors which allow the men to spread the charge, and work, or *rabble*, it from time to time; a hole situated near the bridge, *b*, admits a quantity of air, which can be regulated by means of a register plate. There are four oblong openings, *h h*, in the sole, closed during the roasting with iron plates, on withdrawing which the charge can be raked out into the reservoir, R. The fuel is a mixture of anthracite with small bituminous coal. Roasting furnaces,

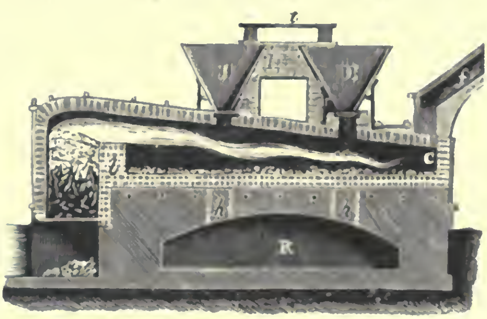


Fig. 101. — COPPER CALCINING FURNACE.

however, are now very commonly provided with Siemen's regenerators, and heated with gas. There can be different kinds of ore mixed together but none of the fragments are larger than a nut. The roasting or calcining goes on for about 12 hours, at a temperature which drives off much of the sulphur. — *Melting for Coarse Metal.* Roasted ore and a little *C.* slag, with some kind of flux metal, and anthracite and bituminous coal as fuel, are thrown into the *coarse melting furnace*, which is maintained at a fierce heat. The result of the process is, that nearly the whole of the *C.* is collected into a mass called *matt*, or *coarse metal*, combined with the residue of the sulphur and iron. — *Calcining the Coarse Metal.* The *matt* obtained by the last process is in small brownish fragments, containing about one third their weight of pure *C.* The calcining of this substance does not differ much from the roasting of the ore. More of the sulphur is driven off by this process; the substance is reduced to small black grains; and it now becomes *calcined coarse metal.* — *Melting for White Metal.* The coarse metal just described is mixed with about an equal weight of rich *C.* ore, copper slag, and waste *C.* of various kinds. These are exposed to a dazzling white heat; and the result of the process is, that two fifths of the weight assume the form of *white metal.* The white metal has a granulated texture and a grayish-white color; it contains about three fourths pure *C.* — *Melting for Blue Metal.* This is another advance towards pure *C.*, certain oxides being driven off by heat. The *blue metal* produced is more compact than the white; it has a deep gray color, and exhibits exceedingly fine particles of metallic *C.* diffused through the mass. — *Making Coarse C.* A good deal of sulphur still remains, together with a little arsenic, iron, tin, nickel, and cobalt; and a further purification is now needed. The chief result is *coarse* or *blistered C.*, which presents a deep red color when fractured; it is run from the furnace into sand-moulds, where it forms pigs or slabs 3 feet long by 1½ feet wide. — *Refining and Toughening.* At length we come to the end of the processes. The coarse *C.* is thrown into large furnaces, in charges of 7 tons at a time. Almost

all the remaining sulphur and arsenic are driven off, and the metal gradually assumes various conditions, becoming more and more pure as it proceeds. When ready, it is laded out of the furnace, and cast into cakes of *ordinary C.*, about 18 inches by 12. The cake *C.* sent into the market obtains the name of *best selected, tough, common, tile*, etc., according to its quality. The *best selected* differs very little from absolutely pure *C.* A great variety of improvements in *C.*-smelting have been prepared and patented, one or two of which have been usefully applied. Several modifications of the various processes are also adapted to suit the quality of the ores and the kind of *C.* to be produced. *C.* is also obtained from its ores by the *wet method*, which is substantially the precipitation of metallic *C.* from the solution of its chloride. This method is chiefly practised with ores containing less than 4 per cent of *C.*

C. Manufacturing. The fashioning of *C.* into useful and ornamental articles does not comprise so many processes as that of iron, because the metal is neither *welded* nor *forged*. The *C.* — in *tiles* 9 or 10 inches square by 1 inch thick, or in *cakes* somewhat larger — is cast into ingots of various sizes and shapes, and most of it rolled into sheets; but some articles are cast without the metal undergoing any rolling. The malleability of *C.* permits of its being hammered into form with great facility. Thus, a mass shaped like a double convex lens can be hammered into a hemispherical vessel, such as those used in the sugar manufacture; the heavy blows which thin out the central thicker portion make the edge gradually turn up. The riveting of joints; the planishing or condensing of surface by repeated hammering; the cooling and drawing of strips into the forms of tubes and pipes; the soldering or brazing of two pieces together; the casting in moulds of loam or sand, — these are the chief processes, besides rolling into sheets and hammering with hammers, by which the countless articles in *C.* are made.

Copperah, Copra, an Eastern name for the dried oily pulp of the cocoa-nut, used for expressing oil from.

Copperas [Fr. *couperose;* Latin *cupri rosa*, the flower of copper], the familiar but unsuitable name for a substance which contains no copper whatever, the *sulphate of iron*, or green vitriol. See VITRIOL.

Copper-Bit, a tool used for soldering. It consists of a pointed piece of copper with a wooden handle, riveted to an iron shank.

Copper-Bottomed, a term applied to vessels sheathed with copper sheets or yellow composition metal below the water-mark.

Copper Coinage, the term most generally applied to the petty coinage for mercantile transactions, and for the convenience of small traders. The total value of the minor coins of the U. States, coined from 1793 down to the close of the fiscal year 1878, is $12,915,397.55, of which the following is a detailed account: —

Five-cent (*nickel*), authorized to be coined, act of May 16, 1866; weight, 77.16 grains, composed of 75 per cent copper and 25 per cent nickel; total amount coined, $5,773,170.

Three-cent (*nickel*), authorized to be coined, act of March 3, 1865; weight, 30 grains, composed of 75 per cent copper and 25 per cent nickel; total amount coined, $855,138.

Two-cent (*bronze*), authorized to be coined, act of April 22, 1864; weight, 96 grains, composed of 95 per cent copper and 5 per cent tin and zinc; coinage discontinued, act of February 12, 1873; total amount coined, $912,020.

Cent (*copper*), authorized to be coined, act of April 2, 1792; weight, 264 grains; weight changed, act of January 14, 1793, to 208 grains; weight changed by proclamation of the President, January 26, 1796, in conformity with act of March 3, 1795, to 168 grains; coinage discontinued, act of February 21, 1857; total amount coined, $1,562,887.44.

Cent (*nickel*), authorized to be coined, act of February 21, 1857; weight, 72 grains, composed of 88 per cent copper and 12 per cent nickel; coinage discontinued, act of April 22, 1864; total amount coined, $2,007,720.

Cent (*bronze*), coinage authorized, act of April 22, 1864; weight, 48 grains, composed of 95 per cent copper and 5 per cent tin and zinc; total amount coined, $1,764,546.

Half-cent (*copper*), authorized to be coined, act of April 2, 1792; weight, 132 grains; weight changed, act of January 14, 1793, to 104 grains, and by proclamation of the President, January 26, 1796, to 84 grains; coinage discontinued, act of February 21, 1857; total amount coined, $39,926.10.

The exact amount of minor coins actually in circulation is unknown; but it may be inferred that it is beyond the wants of the country, from its accumulation in the various offices of the Treasury, which, from $157,000 in 1876, increased to $877,000 in 1877, and $1,410,898.50 in 1878, representing at least 150 tons metal. Of this total, $1,036,422.55 consisted of five-cent nickel coins, and it may be anticipated that in a very short time the whole emission of this coin, of merely nominal value, will have entered the vaults of the Treasury.

Copper-Fastened, a term applied to vessels or boats which have rivets and bolts of copper to secure the timber and planks, etc.

Copper-Founder, one who casts copper-metal into moulds and shapes.

Coppering. This is a mode of coating iron with a thin film of copper, which is made by cleansing the iron with dilute acid, and dipping it into a bath of oxide of copper, nitric acid, ale, and water, when a film of copper is deposited. Electro-coppering is, however, a more perfect plan. See ELECTRO-METALLURGY.

Copper-Nickel, an ore found in France, etc., which consists of a compound of arsenic with nickel.

Copper-Ore. See COPPER.

Copper-Plate Engraving. The delicate work which the copper-plate engraver has to do is just the reverse of that described under wood engraving. The plate is first brought to a very smooth surface. The engraver employs many fine and sharp tools, called *gravers, scrapers, dry-points*, and *burnishers*, to cut away the copper, and to leave clear and smooth edges to every incision. If nearly the whole picture is presented in incised lines, straight and curved, it is called *line engraving*. If the plate is hacked or notched all over with a toothed instrument called a *cradle*, and the device produced by scrapers and burnishers on this surface, it is called *mezzotint engraving*. If the plate is coated with a solution of resin in spirit of wine, and aquafortis be made to act on this in a peculiar way, it is *aquatint engraving*, somewhat resembling an Indian ink drawing. See, also, ETCHING. Steel-engraving differs little from copper-plate, except in the hardness of the metal, and the time required to cut into it. It is coming more and more in use, owing to the large number of impressions that can be taken before the plate is worn out.

Copper-Plate Maker, one who shapes, smooths, and prepares metal plates for engraving.

Fig. 102. — ROLLING-PRESS.

Copper-Plate Printing differs from ordinary letterpress printing in this, that whereas in the latter the ink is on the surface, and avoids the hollows, in the former it is in the hollows, and avoids

the surface. The *rolling-press* (Fig. 102) for copper-plate printing has two rollers; a flat board or table can pass between them, and by working the rollers the table receives a horizontal movement to and fro. The copper-plate, having been finished by the engraver, is heated to 180° F., and then coated with ink by means of a linen rubber or pad, so repeatedly and carefully applied as to insure that every line of the device shall receive a supply of ink. The surplus ink that covers the whole of the surface is wiped off, first with a cloth, and then with the hand. The plate thus inked is placed face uppermost on the table; a sheet of paper is placed on it; three or four folds of flannel or blanket cover the paper; the rollers are worked by a kind of lever winch; the table is brought between the two rollers; and a pressure is exerted sufficiently to produce a clear print from the plate. — *Steel*-plate printing is executed in the same way as *copper*-plate.

Copper-Pyrites, the most important and ordinary ores of copper, which are sulphurets of copper and iron.

Copper-Sheathing, thin sheets of copper for nailing on ships' bottoms to preserve the timber.

Copper-Smelter, one who melts copper ore.

Copper-Smith, a worker in copper, who frequently combines the trade of brazier and tin-plate worker.

Copper-Wire, fine drawn wire of copper, used for various purposes. Copper-wire is now largely in demand for electric telegraphs.

Coppice-Wood, small brushwood; underwood.

Coppin. See Cop.

Coppo, a measure for oil at Lucca, containing nearly 200 lbs. avoirdupois.

Copra. See Copperah.

Coprolites, the fossil excrements of extinct animals, which, from the large quantity of phosphate of lime they contain (50 to 55 per cent) when digested with sulphuric acid, form a valuable fertilizer for land. Considerable deposits of C. are found in the upper green sand in Cambridgeshire, England.

Copy, a printer's term for anything furnished him to compose in type, whether manuscript or printed matter.

Copy-Book, a ruled book for practising writing in.

Copy-Hold, a legal term for manorial lands held on a tenure by copy of court-roll.

Copying, taking a fac-simile or impression; hence the terms copying-clerks, copying-machine, copying-paper, etc.

Copying-Clerk, a clerk in a merchant's, lawyer's, or other office, whose duty it is to make transcripts of letters and other documents.

Copying-Ink, adhesive ink prepared with gum and other substances for taking one or more impressions or copies from the manuscript.

Copying-Machine. See Copying-Press.

Copying-Paper, thin unsized paper used damp for making impressions from writings.

Copying-Press, a machine by which duplicates of letters and manuscripts may be produced without having recourse to transcription. A copying-machine generally consists of a flat bed, upon which rests the letter to be copied, and the paper for the duplicate. Above these is a flat plate, called a *platten*, which, by means of a screw or lever, is made to produce the necessary pressure. The ink with which the letter is written contains a certain amount of sugar or treacle, which is transferred to the paper laid upon it by the pressure exerted. The copy made is, of course, reversed, but the paper is purposely made thin, in order that the writing may be read through it. Various contrivances have been invented for procuring the necessary amount of pressure, but the simple screw and lever appears to be the best of them all.

Copyright is the exclusive right of multiplying for sale copies of works of literature or art, allowed to the author thereof or his assignees. All statutes relating to C. in this country were repealed by act of Congress, July 8, 1870, which, with an amendment of June 18, 1874, now regulate the entire subject. This law is here given in full, as taken from the *Revised Statutes of the U. States Edition*, 1878: —

Sect. 4952. Any citizen of the U. States, or resident therein, who shall be the author, inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph or negative thereof, or of a painting, drawing, chromo, statue, statuary, and of models or designs intended to be perfected as works of the fine arts, and the executors, administrators, or assignees of any such person shall, upon complying with the provisions of this chapter, have the sole liberty of printing, reprinting, publishing, completing, copying, executing, finishing, and vending the same; and, in the case of a dramatic composition, of publicly performing or representing it, or causing it to be performed or represented by others. Any author may reserve the right to dramatize or to translate their own works.

Sect. 4953. C. shall be granted for the term of 28 years from the time of recording the title thereof, in the manner hereinafter directed.

Sect. 4954. The author, inventor, or designer, if he be still living and a citizen of the U. States or resident therein, or his widow or children, if he be dead, shall have the same exclusive right continued for the further term of 14 years, upon recording the title of the work or description of the article so secured a second time, and complying with all other regulations in regard to original C., within 6 months before the expiration of the first term. And such person shall, within 2 months from the date of said renewal, cause a copy of the record thereof to be published in one or more newspapers, printed in the U. States, for the space of 4 weeks.

Sect. 4955. C. shall be assignable in law, by any instrument of writing, and such assignment shall be recorded in the office of the Librarian of Congress within 60 days after its execution; in default of which it shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice.

Sect. 4956. No person shall be entitled to a C. unless he shall, before publication, deliver at the office of the Librarian of Congress, or deposit in the mail addressed to the Librarian of Congress, at Washington, District of Columbia, a printed copy of the title of the book or other article, or a description of the painting, drawing, chromo, statue, statuary, or a model or design for a work of the fine arts, for which he desires a copyright, nor unless he shall also, within ten days from the publication thereof, deliver at the office of the Librarian of Congress, or deposit in the mail addressed to the Librarian of Congress, at Washington, District of Columbia, two copies of such copyright book or other article, or, in case of a painting, drawing, statue, statuary, model, or design for a work of the fine arts, a photograph of the same.

Sect. 4957. The Librarian of Congress shall record the name of such C. book or other article, forthwith, in a book to be kept for that purpose, in the words following: — "Library of Congress, to wit. Be it remembered that on the —— day of ——, A. D., of ——, hath deposited in this office the title of a book (map, chart, or otherwise, as the case may be, or description of the article), the title or description of which is in the following words, to wit: (here insert the title or description) the right whereof he claims as author (originator or proprietor, as the case may be), in conformity with the laws of the U. States respecting copyrights. C. D., Librarian of Congress." And he shall give a copy of the title or description, under the seal of the Librarian of Congress, to the proprietor, whenever he shall require it.

Sect. 4958. The Librarian of Congress shall receive, from the persons to whom the services designated are rendered, the following fees: — 1st. For recording the title or description of any copyright book or other article, 50 cents. 2d. For every copy under seal of such record actually given to the person claiming the copyright, or his assigns, 50 cents. 3d. For recording any instrument of writing for the assignment of a copyright, 15 cents for every 100 words; 4th. For every copy of an assignment, 10 cents for every 100 words. All fees so received shall be paid into the Treasury of the U. States.

Sect. 4959. The proprietor of every C. book or other article shall deliver at the office of the Librarian of Congress, or deposit in the mail addressed to the Librarian of Congress, at Washington, District of Columbia, within 10 days after its

publication, two complete printed copies thereof, of the best edition issued, or description or photograph of such article as hereinbefore required, and a copy of every subsequent edition wherein any substantial changes shall be made.

Sect. 4960. For every failure on the part of the proprietor of any *C.* to deliver or deposit in the mail either of the published copies or description or photograph, required by sections 4956 and 4959, the proprietor of the *C.* shall be liable to a penalty of $25, to be recovered by the Librarian of Congress, in the name of the U. States, in an action in the nature of an action of debt, in any district court of the U. States within the jurisdiction of which the delinquent may reside or be found.

Sect. 4961. The postmaster to whom such *C.* book, title, or other article is delivered, shall, if requested, give a receipt therefor; and when so delivered he shall mail it to its destination.

Sect. 4962. No person shall maintain an action for the infringement of his *C.* unless he shall give notice thereof by inserting in the several copies of every edition published, on the title-page or the page immediately following, if it be a book; or if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected and completed as a work of the fine arts, by inscribing upon some portion of the face or front thereof, or on the face of the substance on which the same shall be mounted, the following words: "Entered according to act of Congress, in the year ——, by A. B., in the office of the Librarian of Congress, at Washington."

Sect. 4963. Every person who shall insert or impress such notice, or words of the same purport, in or upon any book, map, chart, musical composition, print, cut, engraving, or photograph, or other article, for which he has not obtained a *C.*, shall be liable to a penalty of $100, recoverable one half for the person who shall sue for such penalty, and one half to the use of the U. States.

Sect. 4964. Every person who, after the recording of the title of any book as provided by this chapter, shall, within the term limited, and without the consent of the proprietor of the *C.* first obtained in writing, signed in presence of two or more witnesses, print, publish, or import, or knowing the same to be so printed, published, or imported, shall sell or expose to sale any copy of such book, shall forfeit every copy thereof to such proprietor, and shall also forfeit and pay such damages as may be recovered in a civil action by such proprietor in any court of competent jurisdiction.

Sect. 4965. If any person, after the recording of the title of any map, chart, musical composition, print, cut, engraving, or photograph, or chromo, or of the description of any painting, drawing, statue, statuary, or model or design intended to be perfected and executed as a work of the fine arts, as provided by this chapter, shall, within the term limited, and without the consent of the proprietor of the *C.* first obtained in writing, signed in presence of two or more witnesses, engrave, etch, work, copy, print, publish, or import, either in whole or in part, or by varying the main design with intent to evade the law, or knowing the same to be so printed, published, or imported, shall sell or expose to sale any copy of such map or other article, as aforesaid, he shall forfeit to the proprietor all the plates on which the same shall be copied, and every sheet thereof, either copied or printed, and shall further forfeit $1 for every sheet of the same found in his possession, either printing, printed, copied, published, imported, or exposed for sale; and in case of a painting, statue, or statuary, he shall forfeit $10 for every copy of the same in his possession, or by him sold or exposed for sale; one half thereof to the proprietor, and the other half to the use of the U. States.

Sect. 4966. Any person publicly performing or representing any dramatic composition for which a *C.* has been obtained, without the consent of the proprietor thereof, or his heirs or assigns, shall be liable for damages therefor, such damages in all cases to be assessed at such sum, not less than $100 for the first, and $50 for every subsequent performance, as to the court shall appear to be just.

Sect. 4967. Every person who shall print or publish any manuscript whatever, without the consent of the author or proprietor first obtained, if such author or proprietor is a citizen of the U. States, or resident therein, shall be liable to the author or proprietor for all damages occasioned by such injury.

Sect. 4968. No action shall be maintained in any case of forfeiture or penalty under the *C.* laws, unless the same is commenced within two years after the cause of action has arisen.

Sect. 4969. In all actions arising under the laws respecting *C.*, the defendant may plead the general issue, and give the special matter in evidence.

Sect. 4970. The circuit courts, and district courts having the jurisdiction of circuit courts, shall have power, upon bill in equity, filed by any party aggrieved, to grant injunctions to prevent the violation of any right secured by the laws respecting *C.*, according to the course and principles of courts of equity, on such terms as the court may deem reasonable.

Sect. 4971. Nothing in this chapter shall be construed to prohibit the printing, publishing, importation, or sale of any book, map, chart, dramatic or musical composition, print, cut, engraving, or photograph, written, composed, or made by any person not a citizen of the U. States nor resident therein

International C. "The question of international *C.* between the U. States and England has been for some time the subject of active discussion among the authors and publishers of both countries. The chief opposition to a convention proceeds from various sections of the publishing trade in America. At present a sort of customary *C.* in English books is recognized by certain leading firms. When one of them has, by arrangement with the author, obtained the advance sheets of an English work, there is a tacit understanding that the others are not to reprint that particular work; but this arrangement is practically confined to those who are able to retaliate when the trade courtesy is violated. Thus great publishers have a monopoly of the English trade, and other publishers, who would gladly become their competitors, oppose any International *C.* Act which does not aid them to break down that monopoly."—*E. S. Drone.*

Coquilla-Nut, the fruit of the *Attalea funifera*, a S. American palm (Fig. 103). These hard mot-

Fig. 103. — Coquilla Nut Palm.

tled nuts, which take a fine polish, are largely imported for the purposes of the turner, who shapes them into various small ornamental and useful articles, especially the handles of bell-pulls, the knobs of walking-sticks, umbrellas, etc. The same palm furnishes the piassaba fibre of commerce.

Coquito Palm, the *Jubæa spectabilis* of Chili, which produces minute cocoa-nuts.

Coracle, a rude boat made of wicker-work and hide, used for salmon-fishing in the rivers of Wales, England.

Corah, a measure of length in the East, varying for different goods from 41 to 52½ inches. — An Indian pattern silk handkerchief.

Corah-Grass, **Coray**, a species of *Cyperus*, probably *C. textilis*, from which the corah matting of Madras is made.

Corah Print, printed imitation Indian handkerchiefs.

Coral [Arab. *besed;* Fr. *corail;* Ger. *Korallen;* It. *corale;* Sp. and Port. *coral*], a submarine production, composed of the cells of minute creatures. It grows on rocks, and it is necessary to its production that it shall remain fixed to its place. It is found at different depths; and it is remarked that light exerts a powerful influence on its growth as well as its color, — the tint being darker in proportion to the deepness of the sea. As an ornament, black *C.* is much esteemed; but the red and the pink are also very highly prized. Its value depends on its color, solidity, and size; and while some are worth $2 an oz., others do not sell at 25 cts. per lb. *C.* is an important branch of industry and commerce in Italy. Genoa, Leghorn, and Naples have been from old times the three great entrepôts to which

Fig. 104. — Stem of Coral.

(*With its living Polyps.*)

the raw material has been carried, and where skilful artificers have established themselves in order to work at its transformation. *C.* is obtained in large quantities in the Mediterranean, and at considerable depths, of from 200 to 600 feet. Four varieties are distinguished: — 1st, red, which is subdivided into deep crimson red, paler red, and vermilion, which is very rare; 2d, black; 3d, clear white; 4th, veiled white, which is the most common. The produce of the fishery varies from one year to another, and even in the richest spots the fishery should only be carried on at fixed intervals. The coasts where this precious zoophyte is found in the greatest abundance are those of Corsica, Sardinia, Provence, Africa, the vicinage of Trapani, the Straits of Messina, and the coasts of Algeria, where its artificial propagation is favored by the French government. In the Eastern seas, it is chiefly found in the Arabian Gulf, the west coast of Sumatra, and in Japan. Some kinds of coralline bodies increase to an extraordinary size, forming immense banks or masses of submarine rocks, which are frequently dangerous to navigators. *Imp.* unmanuf. *C.*, free.

The manner of fishing *C.* is nearly the same everywhere. That which is most commonly practised in the Mediterranean is as follows: — 7 or 8 men go in a boat, commanded by the proprietor; the caster throws his net, if we may so call the machine which he uses to tear up the *C.* from the bottom of the sea, and the rest work the boat, and help to draw in the net. This is composed of two beams of wood tied crosswise, with leads fixed to them to sink them; to these beams is fastened a quantity of hemp, twisted loosely round, and intermingled with some loose netting. In this condition the machine is let down into the sea; and when the coral is pretty strongly entwined in the hemp and nets, they draw it up with a rope, which they unwind according to the depth, and which it sometimes requires half a dozen boats to draw. If this rope happens to break, the fishermen run the hazard of being lost. Before the fishers go to sea, they agree for the price of the coral; and the produce of the fishery is divided, at the end of the season, into 13 parts, of which the proprietor has 4, the caster 2, and the other 6 men 1 each; the 13th belongs to the company for payment of boat-hire, etc.

Coral Berry, the Missouri Indian currant.

Coralline, a name given to a coral shade of the aniline colors.

Coral Wood, a hard, fine red cabinet wood, easily polished.

Coratch, a sauce made of ketchup, soy, and essence of anchovies.

Corawa, a strong silky fibre, obtained from a species of *Bromelia*, used by the Indians of Demerara to make bow-strings, nets, fishing lines, cordage, etc.

Corbel, a stone or other projection from the face of a wall, to sustain some superincumbent object; a bolster or support to shorten the bearings on a bridge.

Corbling, in building, a projection of stones "oversailing" or overlapping each other, out of the vertical direction, the centre of gravity being, however, still preserved.

Cord, a measure for firewood, equal to 1,000 billets, or four loads; so called because it was formerly measured by a cord. The dimensions of a *C.* of wood are stated to be eight feet long, four feet high, and four feet broad; the weight being about half a ton. The French cord for measuring wood is replaced by the stere. See Cordage.

Cordage [Fr. *cordage, manœuvres;* Ger. *Tauwerk;* It. *cordame;* Sp. *jarcia, cordaje*], a term used to denote all manner of cords or ropes, how much soever they may differ in size, but especially those used in the rigging of ships. The term *cord* is usually employed to distinguish *C.* of small size, that is, of small circumference; *rope*, to distinguish the larger descriptions of *C.*; and *cable*, to distinguish the largest of all, or the *C.* used in the anchoring of ships. *C.* may be made of an infinite variety of materials, — of everything, in fact, which is slender,

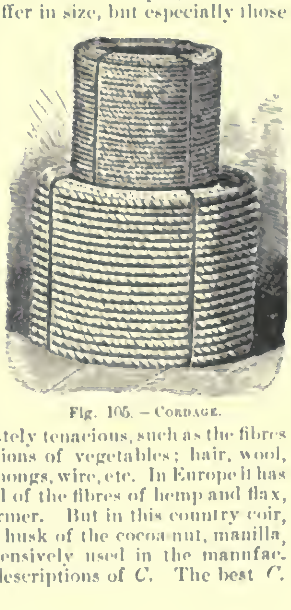


Fig. 105. — Cordage.

flexible, and moderately tenacious, such as the fibres of various descriptions of vegetables; hair, wool, and silk; leathern thongs, wire, etc. In Europe it has been mostly formed of the fibres of hemp and flax, particularly the former. But in this country coir, or the fibres of the husk of the cocoa nut, manilla, hemp, etc., are extensively used in the manufacture of the larger descriptions of *C.* The best *C.*

is that, of course, which is made of the best material and in the most approved manner. It must neither be too much nor too little twisted. Ropes consist of more or fewer yarns according to their thickness. At an average the fibres of hemp used in making ropes lose about ⅓ of their length by twisting; but in the case of cables the loss is greater. Ropes are sometimes made of iron wire; and when properly manufactured they have been found to answer much better than might have been anticipated. Chains are now also frequently substituted for various descriptions of ropes; and everybody knows that hempen cables have been all but wholly superseded by iron chains. In 1878 our imports of *C.* rope and twine (chiefly for England Canada, and Russia) were 1,154,262 lbs., valued at $129,663; while our exports to all countries, but chiefly to Cuba and S. America, amounted to 3,411,413 lbs., valued at $389,004. *Imp.* duty, manilla, untarred, 2½ cts. per lb.; all other, untarred, 3½ cts. per lb.; tarred *C.*, 3 cts per lb. — See CABLE, COIR, etc. See also ROPE-MAKING.

Cordeline [Fr.], the edge or lisiere of silk stuff.

Cordelle, tape, ribbons, and small cords.

Cordial Gin, sweetened gin.

Cordials are warm, stimulating medicines, that tend to raise the spirits and promote the circulation. Those which are articles of commerce are noticed under their specific names. — Also aromatized and sweetened spirits used as beverages. See LIQUEUR.

Cordies, a kind of woollen felt hat, or one covered with camel or goat hair.

Cordillas, a kind of kersey.

Cording-Quires, the outsides of a ream of paper.

Fig. 106. — CORK-TREE (*Quercus suber*).

Cordon, a band or wreath. — A guarded line or circuit kept by appointed officers, to prevent the breaking of quarantine, blockade, smuggling, etc.

Cordonnet [Fr.], coarse silk.

Cordonnier, the French name for shoemaker.

Cordovan [From Cordova, a city of Spain], a Spanish leather made from goat-skin, and finished as black morocco. The term in England is applied to leather made from horse-hide.

Cords. See TASSELS.

Corduroy, a kind of fustian or stout cotton fabric. The common kind is of a plain body, a better is twilled in the back, and the best is twilled on both sides; but there is of each kind a variety of qualities. The usual colors are olive, drab, slate, fawn, and white. It is in pieces varying in length from 40 to 70 yards.

Core, the interior of any thing. — The loose internal part of a mould used in casting to form a hollow or recess, and intercept the flow of the metal.

Corea, a kingdom of Eastern Asia, the greater part of which occupies a peninsula stretching S. from the northern portion of the Chinese empire. It extends from about 34° to 42° 25′ N. lat., and from 124° 35′ to 130° 50′ E. lon. Area about 79,000 sq. m. The king of *C.*, though a vassal of China, is an absolute monarch, and is the object of almost divine honors. The industrial arts are but slightly developed, the only manuf. in which *C.* ranks really high being that of paper, a material employed, as in Japan, in a great variety of ways. Only one kind of coin, a small piece of copper known as a *sapeke*, is recognized, and even this is not recognized in the N. provinces, where barter alone is in vogue. Foreign commerce there is none. The Chinese and Japanese ships are allowed to fish for trepang along the coast of Pieng-an, and for herring on that of Hoang-hai; but they are prohibited not only from landing, but from holding any communication with the Coreans at sea. Estimated pop. 12,000,000.

Corer and Slicer, an implement for cutting the core out of a peeled apple, and at the same time cutting into pieces for cooking or drying. — *Knight.*

Corf, a basket used in coal-mines for carrying coals; a square frame of wood to load the coals on; a sledge to carry ore from the miners to the shaft bottom, to be raised to the surface.

Corfu. See GREECE

Corge, the common East Indian name for a score by which many kinds of dry goods are vended in the bazaars.

Coriander, the globular fruit, improperly called seed, of an annual umbelliferous plant (*Coriandum sativum*), a native of Italy, but cultivated in many countries. It is used in medicine as an aromatic and carminative, and on account of its pleasant and pungent flavor it is a favorite ingredient in hot curries and sauces. The fruit is also used in confectionery, and as a flavoring ingredient in various *liqueurs.* The essential oil on which its aroma depends is obtained from it by distillation. The tender leaves and shoots of the young plant are used in soups and salads. *Imp.* free.

Cork [Fr. (the bark) *liége,* (the stopper) *bouchon de liége;* Ger. *Kork;* It. *sughero, sovero;* Port. *cortica de sovreiro*; Sp. *corcho*], the thick and spongy bark of a species of oak (*Quercus suber*, Fig. 106), abundant in dry mountainous districts in the south of France, and in Spain, Portugal, Italy, and Barbary. The tree grows to the height of 30 feet or more, has a striking resemblance to the *Quercus ilex*, or evergreen oak, and attains to a great age. After arriving at a certain state of maturity, it periodically sheds its bark; but this valuable product is found to be of a much better quality when it is artificially removed from the tree, which may be effected without any injury to the latter. After a tree has attained to the age of from 26 to 30

years, it may be barked; and the operation may be subsequently repeated once every 8 or 10 years, the quality of the C. improving with the increasing age of the tree. The bark is taken off in July and August; and trees that are regularly stripped are said to live for 150 years or more. C. is light, porous, readily compressible, and wonderfully elastic. It may be cut into any sort of figure, and, notwithstanding its porosity, is nearly impervious to any common liquor. These qualities make it superior to all other substances for stoppers for bottles, in the manufacture of which it is principally made use of. It is also employed as buoys to float nets, in the construction of life-boats, the making of inside soles of shoes, on account of its slow conductibility of heat, and in various other ways. The best white C. is grown in France, but this country is chiefly supplied from Spain. — C. is also the name commonly given to the stopper or plug for a bottle or jar cut from the above substance. The common practice of employing inferior C. for the purpose of stopping the mouths of bottles is often productive of considerable loss, from the air being only partially excluded, and the contents suffering in consequence. The best C. are those called *velvet* C., and of these the finest qualities come from France. Common C. are generally imported from Barcelona, Spain. In 1878, the value of imports of manuf. C. was $61,127; of unmanuf. C. $12,406, against $698,169 in 1877. *Imp.* duty (the bark, or cut in small squares) free; all manuf. of C., 30 per cent.

Manuf. — Before being manufactured into stoppers, the C. is charred on each side; this makes it contract, lessens its porosity, and consequently fits it better for cutting off all communication between the external air and the liquid in the bottle. Soft and pliable as C. is, its cutting, nevertheless, requires much tact to get the edge of the knife to bite well into the substance. For making ordinary bottle-C., the C. is cut into small square pieces. The knife has a thin and sharp blade, which requires to be sharpened almost every instant to preserve the proper condition of edge. The workman holds the piece of C. down on a board or bench with his left hand, and cuts with the knife held in his right; and much tact is required to give the proper curvature to the C. It may be a *cork*, a *bung* or a *tap*; and its length may be *short*, *long*, or *full long*; but the mode of cutting remains nearly uniform. Machines of great ingenuity have been introduced into this manufacture, but hand-made C. continue to be those most in use. It is said that a skilful C.-cutter will so manage his material as to obtain a greater number of C. from a given quantity than a machine, seeing that he can accommodate the movements of his knife to any variations in the thickness or quality of the C. The cuttings form an excellent stuffing for beds and cushions; while the refuse parings, when burned, yield *Spanish black*.

Cork, a seaport of Ireland. See GREAT BRITAIN.

Cork-Cutter, a manufacturer of cork bark for commercial purposes.

Corker, a wedge used to stretch women's boots and shoes.

Corking-Machine is a machine for driving corks into bottles.

Cork-Jacket, a belt of corks, worn to float the person in water.

Cork-Screw, a lever for extracting the cork from a bottle, which is either simple or complicated.

Cork-Sole, a thin slice of cork bark, used for the inside of slippers and shoes, and sometimes between the soles of walking-boots, to keep the feet dry. C.-S. are also now frequently placed between the iron shoe and frog of a horse.

Corn [Dutch, *granen*, *koren*; Fr. *blés*, *grains*; Ger. *Korn*, *Getreide*; It. *biade*, *grani*; Latin, *frumentum*; Port. *grãos*; Sp. *granos*] means strictly "grain in the ear," or "grain unthrashed;" but in Europe, and frequently also in this country, the term is applied in a more comprehensive sense to all kinds of grain or pulse fit for food, in whatever state of preparation. Commercially the name C. applies specially in the U. States to Indian C. or maize; while in England the bread C. is chiefly wheat; in Scotland the name is given to oats before they are ground; in Sweden, Iceland, etc., it denotes barley; hence it may be inferred that the term is generally applied to that species of grain which is most commonly used for food in any particular region. See BARLEY, INDIAN CORN, OATS, RYE, WHEAT, etc.

Cornamusa [It.], the bagpipe.

Corn-Bagging, sacking suited for grain-bags.

Corne, the French name for horn.

Corned Meat, flesh slightly salted, intended for early use, and not for keeping for any time.

Cornel, the cornelian cherry, *Cornus mas* (Fig. 107), a common tree furnishing a durable wood, used for wheel-work, wedges, pins, etc. The austere subacid fruit was formerly fermented for a beverage.

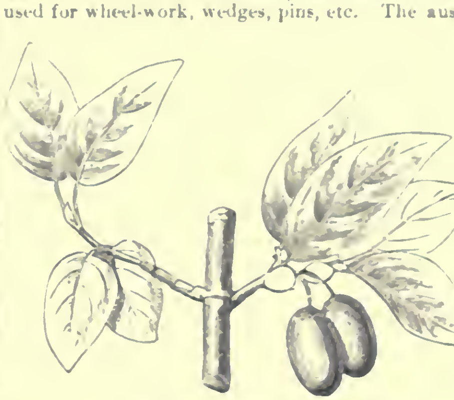


Fig. 107. — CORNEL-TREE.

Cornelian. See CARNELIAN.

Corneo, a Spanish ore of quicksilver.

Corneous, horny, resembling horn in color or texture.

Corner, a term used in reference to certain kinds of transactions between stock brokers; or applied to transactions between speculators in stocks, grain, or other commodities, sold under a contract to deliver at a future day, and when the time for delivery arrives, the seller finds that the buyer, or a combination or clique, have control of the market, so that he is unable to make the delivery except upon such terms as the buyer chooses to exact; or in other words, he is driven into a *corner*, — a position of difficulty. — *T. McElrath.*

Corner-Stone, the union stone of the two angles of a wall; the first or foundation stone laid of a building.

Cornet, a paper bag or cap used by retailers to enclose small wares. — A musical wind instrument resembling a trumpet, and used in brass bands. — An organ stop.

Cornet-a-Piston, a brass musical wind instrument of the French horn class, furnished with valves and stoppers (pistons).

Corn-Exchange, a place of meeting for dealers in grain and flour, where business is transacted by samplers.

Corney, a grain measure in Ceylon, of 4½ seers, about 9¼ lbs.

Corn-Field, a space of land devoted to the culture of grain.

Corn-Husk, the sheaths of the ears of Indian corn. They are torn into long shreds by a splitting machine for stuffing for mattresses, etc.

Cornice, an upper moulding, or finished ornamental projection. — A gilded or other ornamental work within which window-curtains are suspended.

Cornichon [Fr.], a gherkin.

Corning, a name given to the process of granulating gunpowder. — The salting and curing meat.

Corning, Cowanesque, and Antrim R.R. runs from Corning, N. Y., to Antrim, Pa., with branch 64 m. This Co., whose offices are in Watkins, N. Y., was formed by the consolidation, on Jan., 1873, of the Blossburg and Corning and the Wellsboro' and Lawrenceville R.R. Cos., to which was added in 1874 the Cowanesque Valley R.R. Financial statement, Jan. 1, 1879: — Common stock, $1,400,000; preferred stock, $500,000; funded debt, 1st mortgage, C. C. & A. 7% gold, 20 year bonds, payable July 1, 1885, $500,000. Total, stocks and bonds, $2,400,000. The bonds are redeemable by annual instalments of $20,000, commencing in 1880.

Corn-Lift, an elevator or contrivance for raising grain to the upper floors of a granary or mill.

Corn-Mill, an iron farm or plantation mill, for

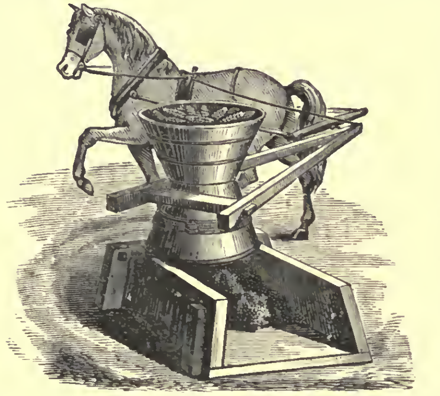


Fig. 108. — Corn-Mill.

grinding Indian corn on the cob for stock. Fig. 108 represents the *C.-M.* manufactured by the Metropolitan Agricultural Works of New York. It is worked by a horse, and can grind corn fine enough for family use.

Corno [It.], a horn.

Cornopean, a musical wind instrument with valves of the horn kind.

Corn-Planter. See Planter.

Corn-Sheller, a machine, of which there are many kinds, for removing the grain of maize from

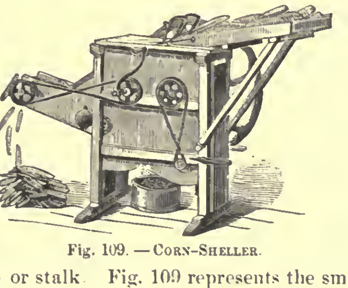


Fig. 109. — Corn-Sheller.

the cob or stalk. Fig. 109 represents the smallest size of *C.-S.* made by the Sandwich Manufacturing Co., Illinois.

Corn-Starch. See Starch.

Coromandel-Wood, the wood of a tree of great size (*Dyospyrus hirsuta*), used in cabinet-work, like zebra and rose wood. But it is inferior to the last in the brilliancy and division of its colors, having a dingy ground, and sometimes running into white streaks. It is chiefly imported from Madras.

Corozo-Nuts. See Vegetable Ivory.

Corporation is an association of persons which the common law treats in many respects as if it were itself a person. It has rights and duties of its own which are not the rights and duties of the individual members thereof. Thus a *C.* may own land, but the individual members of the *C.* have no rights therein. A *C.* may owe money, but the corporators as individuals are under no obligation to pay the debt. The rights and duties descend to the successive members of the *C.* This capacity of perpetual succession is regarded as the distinguishing feature of *C.* as compared with other societies. *Business C.*, however, are now governed in most of the U. States by new and special statutes, very similar in their principal enactments, which exclude or modify the operation of the common-law principles.

The *General Act for Organizing Business Corporations* in the State of New York, passed June 21, 1875, is as follows: —

Sect. 1. *C.* may be organized under the provisions of this act for the carrying on of any lawful business except banking, insurance, the construction and operation of railroads or aiding in the construction thereof, and the business of savings banks, trust companies, or *C.*, intending to derive profit from the loan or use of money, or safe-deposit companies, including the renting of safes in burglar and fire-proof vaults.

Sect. 2. When so organized, every such *C.* shall possess the following general powers: 1. To have succession by its corporate name for the period limited in its certificate of incorporation; 2. To sue and be sued; to complain and defend in any court; 3. To make and use a common seal and alter the same at pleasure; 4. To appoint such subordinate officers and agents as the business of the *C.* shall require, and its by-laws shall provide for; 5. To make by-laws for the management of its property, the regulation of its affairs, for the transfer of its stock and defining the duties of its officers, and from time to time to amend the same; 6. To purchase, hold, and possess so much real and personal estate as shall be necessary for the transaction of its business, and sell and convey the same when not required for the use of the *C.*; provided, however, that all real estate acquired in satisfaction of any liability or indebtedness, unless the same be necessary and suitable for the uses and business of the *C.*, shall be sold within three years after becoming the property of the *C.*, but such time may be extended to a period not exceeding five years in all, by an order of the Supreme Court made in the district in which the principal business office of such *C.* is located, on the verified petition of such *C.*, stating the reasons for such extension.

Sect. 3. Whenever five or more persons, a majority of whom shall be citizens and residents of the State, shall propose to form a *C.* under the provisions of this act, they shall make a certificate to that effect, which certificate shall be signed by each of such persons and duly acknowledged by them before some officer authorized to take acknowledgments under laws of this State. Such certificate shall set forth: 1. The name of the proposed *C.*; 2. The object for which it is to be formed, including the nature and locality of its business; 3. The amount and description of the capital stock; 4. The number of shares of which such capital stock shall consist; 5. The location of the principal business office; 6. The duration of the *C.*, which, however, shall not exceed fifty years.

Sect. 4. Such certificate shall be filed in the office of the Sec. of State; and the Sec. of State shall thereupon issue a license to the persons making such certificate, empowering them as commissioners to open books for subscriptions to the capital stock of such *C.* at such times and places as they may determine; but no license shall be issued in the case of a proposed *C.* having the same name as an existing *C.* in this State, or a name so nearly resembling that of an existing *C.* as to be calculated to deceive.

Sect. 5. Said commissioners shall proceed to open books for subscriptions to the capital stock of such *C.*, and no such subscription shall be received, unless at the time of making it the person so subscribing shall pay to said commissioners ten per cent of the par value of the stock subscribed for in cash. When one half of the capital stock has been subscribed, said commissioners shall call a meeting of the subscribers for the purpose of adopting by-laws for such *C.* and electing directors thereof. Notice of such meeting shall be given to every sub-

scriber by depositing in the post-office, properly addressed to his last known place of residence, and postage prepaid, at least five days before the time fixed, a written or printed notice, stating the time, place, and object of such meeting

Sect. 6. The by-laws of every *C.* created under the provisions of this act, shall be deemed and taken to be its law, and shall provide: — 1. The number of directors of the *C.*; 2. The term of office of such directors, which shall not exceed one year; 3. The manner of filling vacancies among directors and officers. 4. The time and place of the annual meeting; 5. The manner of calling and holding special meetings of the stockholders; 6. The number of stockholders who shall attend, either in person or by proxy, at every meeting, in order to constitute a quorum; 7. The officers of the *C.*, the manner of their election by and among the directors, and their powers and duties; but such officers shall always include a president, a secretary, and a treasurer; 8. The manner of electing or appointing inspectors of election; 9 The manner of amending the by-laws.

Sect. 7. Within ten days after the said subscribers' meeting, said commissioners shall file, in the office of the Sec. of State, a verified record of the proceedings thereof, containing a copy of the subscription list, a copy of the by-laws adopted, and the names of the directors chosen. Thereupon the Sec. of State shall issue to said directors a certificate, setting forth that said *C.* is fully organized in accordance with this act. Such certificate shall include a copy of the original certificate provided for in sect 3 of this act, the date and place of the subscribers' meeting, the names of the directors elected, and a statement that all the provisions of this act have been duly observed in the organization of such *C.* A copy of such certificate shall, within ten days after the issuing thereof by the Sec. of State, be filed in the office of the clerk of the county in which the principal business office of such *C.* is situated. Such certificate shall be recorded at length in a book to be kept in the office of the Sec. of State, to be known as the record of incorporations, and also in a similar book in the office of the county clerk aforesaid. Such certificate, or a copy thereof duly certified by the Sec. of State or his deputy, shall be presumptive evidence of the incorporation of the *C.* named therein, in all courts and proceedings in this State. The Sec. of State shall receive for the filing and issuing of all the necessary documents, in and about the organization of a *C.* under this act, the sum of $10; and for each certified copy of certificate of incorporation the sum of $3, which sum shall be paid into the treasury of the State; and county clerks shall receive the fees now allowed by law. Upon every amendment of the by-laws of any such *C.* a copy of the amended by-laws shall be filed in the office of the Sec of State and of such county clerk, and shall not take effect until so filed; and a copy thereof, certified by the Sec. of State or his deputy, shall be received as presumptive evidence of such amended by-law in all courts and proceedings.

Sect. 8 Unless such *C.* shall be fully organized as provided in the last preceding section, within one year after the issuing of the license to commissioners to open books, such license shall be deemed to be revoked, and all proceedings thereunder shall be void.

Sect. 9. The Sec. of State shall publish, as an appendix to the session laws of each year, a statement of all the *C.* organized under this act during the preceding year, containing in each case the name of the *C.*, its principal business, the location of its principal business office, the amount of capital stock, the date of the filing of the preliminary certificate, and of the granting of the final certificate of incorporation by the Sec. of State, and any change of location or capital of any such *C.* made during the preceding year.

Sect. 10. The business of every *C.* created hereunder shall be managed by a board of directors (the members of which, at their election, and throughout their term of office, shall be stockholders in such *C.* to at least the extent of five shares, and shall hold their offices until their successors are chosen), and by such officers to be elected by and from among said directors as the by-laws shall prescribe. The number of directors shall be not less than five nor more than thirteen; and the number thereof may be changed by a meeting of the owners of a majority of the whole amount of the stock of any *C.*, and pursuant to notice specifying the purpose of such meeting, and served as provided in sect. 5 of this act, in person or by attorney duly authorized, shall be necessary to such change. A majority of the whole number of directors shall be necessary to constitute a quorum. The secretary shall record all the votes of the *C.* and the minutes of its transactions in a book to be kept for that purpose. The treasurer shall give bonds in such sums and with such sureties as are required by the by-laws for the faithful discharge of his duties.

Sect. 11. The capital stock of every *C.* found under this act shall be divided into shares of not less than $25 nor more than $100 each; and shall in no case exceed $2,000,000. All subscriptions therefor shall be made payable to the *C.* in such instalments and at such time or times as shall be fixed by the by-laws or by the directors acting under the by-laws; and if default be made in any payment, an action may be maintained in the name of the *C.* to recover any instalment which shall remain due and unpaid for the period of 30 days after the time so fixed for the payment thereof; and no stockholder shall be entitled to vote at any election or at any meeting of the stockholders on whose share or shares any instalments or arrearages may have been due and unpaid for the period of 30 days immediately preceding such election or meeting The *C.* may, by by-law, prescribe other penalties for a failure to pay the instalments that from time to time become due, not exceeding forfeiture of the stock, and the amount paid thereon, but no such forfeiture shall be declared against any stockholder before demand shall have been made for the amount due thereon either in person or by a written or printed notice duly mailed to such stockholder, at his last known place of residence, at least 30 days prior to the time when such forfeiture is to take effect, and provided further, that upon such forfeiture the shares of stock held by such delinquent stockholder or subscriber shall be sold at public auction at the office of the said *C.*, after 10 days' notice thereof shall be conspicuously posted up in said office, and the proceeds of such sale, over and above the amount due on said shares, and after deducting the expenses of such sale, if any, shall be paid to the delinquent stockholder or subscriber.

Sect. 12. The directors of such *C.* shall prepare certificates of stock, and shall deliver them, signed by the president and treasurer, and sealed with the seal of the *C.*, to each person entitled to receive the same, according to the number of shares held, which certificates of stock shall be transferable at the pleasure of the holder, in person or by attorney duly authorized, subject, however, to all payments due or to become due thereon; and the assignee to whom the same has been so transferred shall be a member of said *C.*, and have and enjoy all the immunities, privileges, and franchises, and be subject to all liabilities, conditions, and penalties incident thereto, in the same manner as the original holder would have been; but no certificate shall be transferred so long as the holder thereof is indebted to such *C.*, unless the board of directors shall consent thereto.

Sect. 13. It shall be lawful for all such *C.* to borrow money for the legitimate purposes of such *C.*, and for such purpose to issue bonds with or without coupons attached thereto, and bearing interest not exceeding 7 per cent per annum; but the amount of such bonds outstanding at any time shall not exceed one half of the value of the corporate property of such *C.* Any issue of bonds beyond the amount herein specified shall render every director voting for the same personally liable to any bondholder for any damage caused by such over-issue to such bondholder.

Sect. 14 No *C.* organized under this act shall issue either stock or bonds except for money, labor done, or property actually received for the use and legitimate purposes of such *C.* at its fair value, and all fictitious increase of stock or indebtedness in any form shall be void

Sect. 15 The capital stock of any *C.* organized under this act may be increased to an amount not to exceed in the aggregate $2,000,000, or reduced by a vote of a majority of the stockholders in number, and representing a majority of the stock of such *C.*, at any meeting thereof convened for that purpose, pursuant to notice thereof specifying the object of such meeting, and served pursuant to the provisions of sect. 5. A statement of such increase or reduction shall be filed in the office of the Sec. of State, and of the clerk of the county in which the principal business office of such *C.* is situated, within 10 days after such action. But before any *C.* shall be entitled to diminish the amount of its capital stock, if the amount of its debts and liabilities shall exceed the amount of capital to which it is proposed to be reduced, such amount of debts and liabilities shall be first satisfied and reduced so as not to exceed such diminished amount of capital.

Sect. 16. It shall be the duty of the directors of every such *C.* to cause to be kept at its principal office, or place of business, correct books of account of all its business and transactions, and every stockholder in such *C.* shall have the right at all reasonable times by himself or his attorney to examine the records and books of account of such *C.*

Sect. 17. It shall be the duty of the directors of every such *C.* to cause a book to be kept by the treasurer or clerk thereof containing the names of all persons, alphabetically arranged, who are or shall, within 6 years, have been stockholders of such *C.*, and showing their places of residence, the number of shares of stock held by them respectively, and the time when they respectively became the owners of such shares, and the amount actually paid thereon; which book shall, during the usual business hours of the day, on every day except Sundays and legal holidays, be open for the inspection of stockholders and creditors of the *C.*, and their personal representatives, at the principal business office of such *C.*; and any and every such stockholder, creditor, or representative shall have a right to make extracts from such book; and no transfer of stock shall be valid for any purpose whatever, except to render the person to whom it shall be transferred liable for the debts of the *C.*, according to the provisions of this act, until it shall have been entered therein as required by this section, by an entry showing from and to whom transferred. Such book shall be presumptive evidence of the facts therein stated, in favor of the plaintiff in any suit or proceeding against such *C.*, or against any one or more stockholders. Every officer or agent of any such *C.* who shall neglect to make any proper entry in such book, or

shall refuse or neglect to exhibit the same, or allow the same to be inspected, and extracts to be taken therefrom, as provided by this section, shall be deemed guilty of a misdemeanor; and the *C.* shall forfeit and pay to the party injured a penalty of $50 for every such neglect or refusal, and all the damages resulting therefrom. And every *C.* that shall neglect to keep such book open for inspection as aforesaid shall forfeit to the People the sum of $50 for every day it shall so neglect, to be sued for and recovered in the name of the People of the State, by the district attorney of the county in which the principal business office of such *C.* is located, and the amount so recovered shall be paid to the proper authorities for the support of the poor of such county.

Sect. 18. Every such *C.* shall annually, within twenty days after the first day of January, make a report, which shall state the amount of capital, and the proportion actually paid in, the amount and, in general terms, the nature of its existing assets and debts, and the dividends, if any, declared since the last report, which report shall be signed by the president and a majority of the directors, and shall be verified by oath of the president or secretary of such *C.*, and filed in the office of the Sec. of State, and if any such *C.* shall fail so to do, all the directors thereof shall be jointly and severally liable for all the debts of the *C.* then existing, and for all that shall be contracted before such report shall be made. Provided that if any director shall file with the Sec. of State, at any time within thirty days after such first of January, a certificate, verified by the oath of such director, stating that he has endeavored to have such report made and signed as aforesaid, but that the officers or a majority of the directors have refused or neglected to make and file such report; and shall append to such certificate a report containing the items aforesaid, so far as they are within his knowledge or are obtainable from sources of information open to him, which report shall be verified by him as being true to the best of his knowledge, information, and belief, in that case such director shall not be liable on account of such failure to make and file such report upon making proof of such facts in any action which may be commenced against him, upon the trial thereof. Whenever, under this section, a judgment shall be recovered against a director, severally, all the directors of the *C.* shall contribute a ratable share of the amount paid by such director on such judgment, and such director shall have a right of action against his co-directors, jointly or severally, to recover from them the proportion of the amount so paid on such judgment.

Sect. 19. If the directors of any such *C.* shall declare and pay any dividend when the *C.* is insolvent, or any dividend the payment of which would render it insolvent or which would diminish the amount of its capital stock, the directors voting in favor of declaring such dividend shall be jointly and severally liable for all the debts of the *C.* then existing, and for all that shall be thereafter contracted while they shall respectively continue in office.

Sect. 20. No loan of money shall be made by any such *C.* to any stockholder therein, and if any such loan shall be made to a stockholder, the officers who shall make it, or who shall assent thereto, shall be jointly and severally liable to the extent of such loan and interest for all the debts of the *C.* contracted before the repayment of the sum so loaned.

Sect. 21. If any certificate or report made, or public notice given, by the officers of any such *C.*, shall be false in any material representation, all the officers who shall have signed the same shall be jointly and severally liable for all the debts of the *C.* contracted while they are officers thereof.

Sect. 22. If the indebtedness of any such *C.* shall at any time exceed the amount of its capital stock, the directors of such *C.* creating such indebtedness shall be personally and individually liable for such excess to the creditors of such *C.*

Sect. 23. No person holding stock in any such *C.*, as executor, administrator, guardian, or trustee, and no person holding such stock as collateral security, shall be personally subject to any liability as stockholder of such *C.*; but the person pledging such stock shall be considered as holding the same, and shall be liable as a stockholder accordingly; and the estates and funds in the hands of such executor, administrator, guardian, or trustee, shall be liable in like manner, and to the same extent, as the testator or intestate, or the ward or person interested in such trust fund would have been, if he had been living and competent to act, and held the same stock in his own name.

Sect. 24. Every such executor, administrator, guardian, or trustee shall represent the share or shares of stock in his hands at all meetings of the *C.*, and may vote accordingly as a stockholder, and every person who shall pledge his stock as aforesaid may nevertheless represent the same at all such meetings, and may vote accordingly as a stockholder.

Sect. 25. No stockholder shall be personally liable for the payment of any debt contracted by any *C.* formed under this act, which is not to be paid within two years from the time the debt is contracted, nor unless an action for the collection of such debt shall be brought against such *C.* within two years after the debt shall become due; and no action shall be brought against any stockholder who shall cease to be a stockholder in any such *C* for any debt so contracted, unless the same shall be commenced within two years from the time he shall have ceased to be a stockholder in such *C.*

Sect. 26. The annual election of directors shall be held at such time and place as shall be designated by the laws of the *C.*, and public notice of such time and place shall be published not less than ten days previous thereto in a newspaper published in a city or town in which the principal business office of the *C.* is situated, if a newspaper be published therein, and otherwise in the newspaper published nearest to said office; and the election shall be made by such of the stockholders as shall attend for that purpose, either in person or by proxy. No person shall be permitted to vote upon the proxy of a stockholder in any such *C.* after the lapse of eleven months from the date thereof, unless the stockholder shall have specified therein that it is to continue in force for some longer and limited time. All elections shall be by ballot, and each stockholder shall be entitled to as many votes as shall equal the number of his shares multiplied by the number of directors to be elected, and he may distribute his votes among those to be voted for as he sees fit; and the persons receiving the greatest number of votes shall be directors; and when any vacancy shall occur among the directors by death, resignation, or otherwise, it shall be filled for the remainder of the year in such manner as may be provided for by the by-laws of the said corporation.

Sect. 27. In case it shall happen at any time that an election of directors shall not be made on the day designated by the by-laws of said *C.*, when it ought to have been made, the *C.*, for that reason, shall not be dissolved, but it shall be lawful, on any other day within three months thereafter, to hold an election for directors, upon service of notice upon the stockholders thereof respectively in the manner provided in sect. 5 of this act; and all acts of directors shall be valid and binding as against such *C.* until their successors shall be elected.

Sect. 28. Every person acting as an inspector of election in any such *C.* shall, before entering upon the duties of his office, take and subscribe an oath or affirmation before some officer authorized to administer the same, that he will discharge the duties of his office with fidelity, and that he will not receive any vote but such as he believes to be legal, nor reject any which he believes to be legal; and if any such inspector shall violate this oath or affirmation, he shall be subject to all the penalties imposed by law upon inspectors of general State elections in this State violating their duty, and shall be proceeded against in like manner and with like effect.

Sect. 29 Whenever any *C.* organized under this act has fixed the duration of its corporate existence for a less period than fifty years, it may, at any time, extend the term of its existence beyond the time mentioned in the original certificate of incorporation by the consent of the stockholders owning two thirds in amount of the capital stock of such *C.*, in and by a certificate, to be signed by such stockholders, in person or by attorney duly authorized and acknowledged or proved, so as to enable it to be recorded, which certificate shall be filed in the office of the Sec. of State, and of the clerk of the county in which the principal business office of such *C.* is situated; and the said Sec. of State and the county clerk respectively upon such filing shall record the same in the record of *C.* kept in this office, and make a memorandum of such record in the margin of the original certificate in such record book; and thereupon the time of existence of such *C.* shall be extended, as designated in such certificate, for a term which, with the term originally fixed, will not exceed fifty years.

Sect. 30. Every *C.* organized under this act shall be taxed on all of its property, except its real estate in the town, city, or village where its principal business office is situated, and on its real estate in the town, city, or village where such real estate is situated shall be taxed therein.

Sect. 31. Such *C.* may change its principal place of business by the consent of the stockholders owning two thirds in amount of the capital stock of such *C.*, in and by a certificate to be signed by such stockholders in person or by attorney duly authorized and acknowledged or proved, which certificate shall be filed in the office of the Sec. of State, and of the clerk of the county in which the principal business office of such *C.* is situated, and the Sec. of State, and county clerk respectively shall, upon such filing, record the same in the record of *C.* kept in his office, and make a memorandum of such record in the margin of the original certificate recorded in such office, and thereupon the principal business office of such *C.* shall be deemed to be changed as stated in said certificate.

Sect. 32. Any existing business *C.*, heretofore organized under the general laws of this State, or by special charter, may come under and avail itself of the privileges and provisions of this act, by complying with the following provisions: The directors of such *C.* shall publish a notice, signed by at least a majority of them, in a newspaper in the county in which the principal business office thereof is situated, for at least three successive weeks, and to deposit a written or printed copy thereof in the post-office, postage prepaid, addressed to each stockholder at his last known place of residence, at least three weeks previous to the day fixed upon for holding such meeting, specifying the object of the meeting, and the time and place when and where such meeting shall be held. At the time and place specified in the notice, the stockholders shall organize by choosing one of the directors chairman of the meeting, and also a suitable person for secretary, and proceed to a vote of those present, in person or by proxy; and if

votes representing a majority of all the stock of the company shall be given in favor of availing itself of the provisions of this act, the said officers shall make a certificate of the proceedings showing a compliance therewith, duly acknowledged and stating: 1 The name of the C.; 2. The object for which it is formed, including the nature and locality of its business; 3 The amount and description of the capital stock; 4 The number of shares of which such capital stock consists; 5 The location of the principal business office; 6 The duration of the C., which, however, shall not exceed fifty years; 7. The names of directors. Which certificate with a copy of the by-laws of such C., shall be filed in the office of the Sec. of State, and of the clerk of the county in which the principal business office of such C. is situated. From the time of such filing, such C. shall be deemed to be a C organized under this act; but no such change or proceedings shall in any way affect the existing liabilities of the C. so availing itself of the provisions of this act.

Sect 33 The C formed under this act shall be of two classes, to be known respectively, as: 1. *Full liability companies*. 2. *Limited liability companies*.

Sect. 34. In "full liability companies," all the stockholders shall be severally individually liable to the creditors of the company in which they are stockholders, for all debts and liabilities of such company, and may be joined as defendants in any action against the company No execution shall issue against any stockholder individually, until execution has been issued against the company and been returned unsatisfied, and whenever a judgment shall be recovered against a stockholder individually, all the stockholders shall contribute a proportionate share of the amount paid by such stockholder on such judgment, proportioned to the number of shares of stock owned by each of such stockholders, and such stockholder shall have a right of action against the other stockholders in such C, jointly or severally, to recover from them and each of them, the proper portion due by them and each of them of the amount so paid on such judgment

Sect. 35. In "limited liability companies," the name of the company shall in every case have as its last word, the word "limited," and every such C shall paint or affix, and shall keep painted or affixed, its name on the outside of every office or place in which the business of the company is carried on, in a conspicuous position in letters easily legible, and shall have its full name stated in legible characters in all notices, advertisements, and other official publications of such company, and in all its bills of exchange, promissory notes, checks, orders for money, bills of lading, invoices, receipts, letters, and other writings used in the transaction of the business of the C.

Sect 36 Every omission of the word "limited" in the use of the name of such company shall render each and every officer or director in such company personally liable for any indebtedness, damage, or liability incurred during such omission If any limited liability company under this act does not paint or affix, and keep painted or affixed, its name, in the manner above set forth, it shall be liable to a penalty of not exceeding $25 for such omission, for every day during which such name is not so kept painted or affixed; and every director or officer of such company who shall authorize or permit such omission, shall be liable to a like penalty; and if any director or officer of such company, or any person on its behalf, shall use or authorize the use of any seal, purporting to be a seal of the company, on which its name is not so engraved as aforesaid, or shall use or authorize the issue of any notice, advertisement, or other official publication of such company, or shall sign, or authorize to be signed, on behalf of such company, any bill of exchange, promissory note, indorsement, check, order for money or goods, invoice, bill receipt, letter of credit, or other writing of the company, wherein its name is not mentioned as aforesaid, he shall be liable to a penalty of $100. The penalties in this section provided shall be sued for in the name of the People of the State of New York by the district attorney of the county in which the principal office of such corporation is located, and the amounts recovered shall be paid over to the proper authorities for the support of the poor of such county

Sect. 37. In limited liability companies, all the stockholders shall be severally individually liable to the creditors of the company in which they are stockholders, to an amount equal to the amount of stock held by them respectively, for all debts and contracts made by such company, until the whole amount of capital stock fixed and limited by such company has been paid in, and a certificate thereof has been made and recorded as hereinafter prescribed. The term stockholder as used herein shall apply, not only to such persons as appear by the books of the C. or association to be such, but also to every equitable owner of stock, although the same may appear on such books in the name of another person, and also to every person who shall have advanced the instalments or purchase-money of any stock in the name of any person under 21 years of age, and while such person remains a minor to the extent of such advance; and also to every guardian or other trustee who shall voluntarily invest any trust funds in such stock; and no trust funds in the hands of such guardian or trustee shall be in any way liable under the provisions of this act, by reason of any such investment, nor shall the person for whose benefit any such investment may be made be responsible in respect to such stock, until thirty days after the time when such persons respectively become competent and able to control and dispose of the same but the guardian or other trustee making such investment as aforesaid, shall continue responsible as a stockholder until such responsibility devolves upon the person beneficially interested therein; and in respect to stock held by a guardian or other trustee under a transfer of the same by a third person, or under positive directions by a third person for such investment, the person making such transfer or giving such directions, and his executors and administrators shall, for the purposes of this act, be deemed a stockholder; and the estate of such person, if he be deceased, shall be responsible for the debts and liabilities chargeable on such stock, according to the provisions of this act. No execution shall issue against any stockholder individually, until execution has been issued against the corporation and returned unsatisfied; and whenever a judgment shall be recovered against a stockholder individually, all the stockholders shall contribute a proportionate share of the amount paid by such stockholder on such judgment proportioned to the number of shares of stock owned by each of such stockholders, and such stockholder shall have a right of action against the other stockholders in such C., jointly or severally, to recover from them, and each of them, the proportion due by them and each of them of the amount so paid on such judgment. The capital stock of every such limited liability company shall be paid in, one half thereof within one year, and the other half thereof within two years from the incorporation of said company, or such C. shall be dissolved. The directors of every such company, within thirty days after the payment of the last instalment of the capital stock, shall make a certificate stating the amount of the capital so paid in, which certificate shall be signed and sworn to by the president and a majority of the directors, and they shall, within the said thirty days, record the same in the office of the Sec of State, and of the county in which the principal business office of such corporation is situated.

Sect. 38. The dissolution for any cause whatever, of any C. created as aforesaid, shall not take away or impair any remedy given against such C., its stockholders or officers, for any liabilities incurred previous to its dissolution.

1. Form of Certificate of Incorporation.—(*Business to be carried on within the State*)

State of New York,
Town of Brooklyn, } ss:
King's County.

We, the undersigned citizens of the State of New York, do hereby certify that we have associated together as a manufacturing corporation, to continue in existence for the period of thirty years from the date hereof, for the purpose of carrying on and conducting the manufacture of india-rubber goods

That the corporate name of said corporation is the "East Brooklyn Manufacturing Company."

That the amount of the capital stock thereof is one hundred thousand dollars, and is divided into one thousand shares of one hundred dollars each.

That the number of trustees of said corporation is seven

And that the following are the names of the trustees who will manage its concerns for the first year, to wit: A B, etc

And we do further certify, that the manufacturing operations of the said corporation are to be carried on in the town of Brooklyn aforesaid.

(Signed) A B, etc

Dated August 10, 1879.

2. Form of Certificate of Incorporation.—(*Part of the business to be done out of the State*).

(As in form No 1; adding before signing)

The said corporation is formed for the purpose of carrying on some part of its business out of the State of New York at (insert name of place), but the principal part of the business of said company is to be transacted at said Brooklyn

(Signed) A B., etc.

Dated August 10, 1879.

3. Form of Acknowledgment annexed to Certificate of Incorporation.

State of New York,
King's County.

On the tenth day of August, 1879, before me came the within named A. B, etc., to me known to be the persons described in, and who executed the within instrument, and severally acknowledged the execution thereof. J J.

Justice of the Peace.

4 Form of Proxy to Vote.

Know all men by these presents, that I, A B, of Chicago, do hereby constitute and appoint C D to be my lawful attorney, substitute, and proxy, for me and in my name, to vote on all the stock held by me in the East Brooklyn Manufacturing Company, at any election for directors, as fully as I might or could do, were I personally present at such election

In witness whereof, I have hereunto set my hand and seal this 10th day of August, 1879

In presence of (Signed) A B. [L. S.]

5. Form of Affidavit annexed to Proxy.

I, A. B., of Chicago, do swear, that the shares in the capital stock of the East Brooklyn Manufacturing Company, for which I have given the above power or proxy to vote, do not belong and are not hypothecated to the said C D., and that they are not hypothecated or pledged to any other corporation, or any person or persons whatever; that such shares have not been transferred to him for the purpose of enabling him to vote thereon, and that I have not contracted to sell or transfer them upon any condition, agreement, or understanding, in relation to the manner of voting at any election.

A. B.

Sworn before me this 10th day of August, 1879.

P. M., *Justice, etc.*

6. Form of Power of Attorney for Transfer of Stock.

Know all men by these presents, that I, A. B., for value received, have bargained, sold, and assigned, and by these presents do bargain, sell, and assign unto R. S., the following described stock, to wit, (describe the kind of stock) unto me, belonging and held by certificate No. 103, in my name, and hereunto annexed, and do hereby constitute and appoint G T., the treasurer of said company, my true and lawful attorney, irrevocably, for me and in my name and stead, to assign and transfer the said stock unto the said R. S., and for that purpose to make and execute the necessary acts of assignment and transfer, and an attorney or attorneys under him for that purpose to make and substitute, and to do all other lawful acts requisite for effecting the premises, hereby ratifying and confirming the same.

In witness whereof, I have hereunto set my hand and seal in the city of Boston, the tenth day of August, in the year of our Lord, one thousand eight hundred and seventy-nine.

(Signed) A. B. [L. S.]

7. Form of Acknowledgment annexed to No. 6.

State of Massachusetts, City of Boston, } *ss:*

On the 10th of August, 1879, personally appeared before me, A B., to me known to be the person described in, and who executed the within instrument, and acknowledged the execution of the same for the uses and purposes therein mentioned.

E. F.
Commissioner of Deeds.

Correspondent, one at a distance who carries on commercial intercourse with another.

Corroi [Fr.], a coating stuff for paying a ship's bottom.

Corrosive, having the power to eat away.

Corrosive-Sublimate, the old name for bichloride of mercury. See Mercury.

Corrugated Iron. Corrugation is a convenient mode of imparting strength to thin iron sheets, by bending them into a series of alternate convex and concave curves, whereby they become wrinkled, puckered, gauffered, or crimped. The corrugation is effected by passing the sheets between rollers peculiarly shaped. The sheets thus prepared are largely used for roofs, railway sheds, temporary churches, stores and warehouses, and even boats.

Corsage [Fr.], a lady's waist-dress or bodice.

Corsair, a piratical vessel which cruises about, attacking and plundering merchant ships.

Corset Jeans, twilled cotton cloth for corsets, having sometimes a kind of satin face.

Corsets [Fr.], stays or supports for the waist, worn by females.

Imp. duty: *C*, or manuf. cloth, woven, or made in patterns of such size, shape, and form, or cut in such manner as to be fit for *C.*, valued at not over $6 per doz., $2 per doz. The same, valued at over $6 per doz., 35 per cent.

Corsica [Fr. *Corse*], a large island of the Mediterranean, belonging to France, is situated immediately to the N. of Sardinia (from which it is separated by the narrow strait of Bonifacio, between lat. 41° 20′ and 41° 43′ N., lon. 8° 30′ and 9° 30′ E.; area, 3,376 sq. m.). It lies within 54 m. W. of the coast of Tuscany, 98 m. S. of Genoa, and 106 m. S.E. of the French coast of Nice. The greatest part of *C.* is occupied by lofty and rugged mountains. Agriculture is in a very backward state, owing principally to the minute subdivision of the land, a system which perpetuates the social evils of hereditary feuds and jealousies, by which *C.* has long been distracted. A large proportion of the exports of the island consists of honey and wax, which are procured from the forests. The principal harbors are on the W. side, Ajaccio (cap. of the island, pop. 16,545) and Calvi, and on the E. side, Bastia and Porto Vecchio. At the extreme S. is the harbor and town of Bonifacio. Pop., 258,507.

Corsican Moss, a nutritious, strong-scented sea-weed, the *Plocaria helminthochortos*, found on the coasts of the Mediterranean, recommended medicinally for removing worms. As found in commerce, this moss consists of various marine productions, with a very little *Plocaria* intermixed.

Cortical, belonging to the bark.

Corton. See Burgundy Wines.

Corundum, a mineral, composed of crystalline alumina, in great request for grinding and polishing machinery, plate glass, pebbles, etc. There are several kinds, as common *C.*, or adamantine spar, obtained in the East, the sapphire and ruby, which are termed precious *C.*, and emery.

Corvette, one of the smallest vessels of war, rarely carrying more than 26 guns. It has flush decks, and three square-rigged masts.

Cosaques, a French fancy paper for wrapping sweetmeats.

Cos-Lettuce, an esteemed variety of lettuce, with leaves of an oblong shape.

Cosmetics, an external application employed for the purpose of preserving or restoring personal beauty. The term is generally understood to refer to substances applied to the cuticle, to improve the color and clearness of the complexion; but some writers have included under this head every topical application used with the like intention. Hence, cosmetics may be divided into *cutaneous C.*, or those applied to the skin; *hair C.*, or such as are employed to promote the growth and beauty of the hair; and *teeth C.*, or such as are used to cleanse and beautify the teeth. See Cosmetique, Dentifrice, Depilatory, Hair-Dye, Pomade, Tooth-Powder, etc. For internal revenue regulations, see Medicine; and for *Imp.* duty, see Toilet Articles.

Cosmetique [Fr.], a hard and scented pomatum, formed into a cake or stick, for the toilet. It is sometimes colored black or brown, the pigments being added in the state of an impalpable powder. It is used to color mustaches, eyebrows, whiskers, etc., as well as to keep the hair in its place.

To make *Black C.* (*C. noir*), take good lard, 5 parts; wax, 2 parts (or, hard pomatum, 7 parts); melt; stir in levigated ivory black, 2 parts; and pour it into moulds of tinfoil, which are afterwards to be placed in paper sheaths.—*Brown C* (*C. brun*), as the last, but using levigated umber for "plain brown," and levigated terra di Sienna for "auburn" and "chestnut" — *White C.* (*C. blanc*) is the same, without coloring matter.

Coss, a corrupted term for the karoh or krossah, an Indian itinerary or road measure, which varies in different places, averaging, however, about 1¼ mile. It is generally distinguished into the standard C., which ranges from 35 to 45 to the degree, and the common *C.*, from 1 to 2¼ miles. The Bengal *C.* of 1,000 fathoms is 1 mile, 1 furlong, 3 poles, and 3¼ yards.

Cossas, a kind of plain Indian muslin.

Costa Rica, the most southern of the five republics of Central America, occupies the isthmus between about lat. 8° and 11° N., and lon. 82° and

86° W. It is bounded N. by Nicaragua, S. by the Colombian State of Panamá, N.E. by the Caribbean Sea, and S.W. by the Pacific Ocean. The population, which consists mainly of people of Spanish descent, little mixed with foreign elements, is officially estimated at 175,000, including about 5,000 civilized Indians of pure blood, 1,200 negroes, and 600 Chinese; but besides these there are from 10,000 to 12,000 uncivilized Indians within the limits of the republic. San José, the capital (pop. 15,000), is situated among the mountains, midway between the Pacific Ocean and the Caribbean Sea. The country is governed under a constitution bearing date Dec. 22, 1871. By its terms the legislative power is vested in a congress, called the *Congreso Constitucional*, chosen in electoral assemblies, the members of which are returned by universal suffrage. The members of the Congress are elected for the term of 4 years. The executive authority is in the hands of a president, elected in the same manner as the Congress for the term of 4 years. There have been constant changes in the executive in recent years, owing to civil wars and insurrections, which did not allow many presidents to serve the full term of office.

The Atlantic coastland of *C. R.* is generally low, and is characterized by numerous lagoons, which have been formed by the prevailing currents opposite the river mouths, the chief break in its extent being the great Lagoon or Gulf of Chiriqui. The Pacific coast rises higher, and is marked by the two large peninsulas which enclose the Gulfs of Nicoya and Dulce. Inland the surface of the country is much diversified, but is chiefly occupied by mountains, plateaus, and valleys. In contrast to the S.W. descent, the Atlantic slope is covered with dense, impenetrable forest, and has remained almost closed to traffic and civilization from the earliest times of colonization. Indians, still living in a savage state, occupy some portions of this wild forest country. They are perfectly uncivilized, hunters with bow and arrow, and are independent of the government; they trade a little with adventurers from Jamaica, bartering sarsaparilla, hides, and turtle-shells for arms and powder, cotton stuffs, and tobacco. The Mosquito Indians come annually in canoes to the Atlantic coast in May and June to fish for turtle in the Lagoon of Chiriqui. The Pacific slope, on the other hand, is characterized by wide savannas or llanuras, bordered by forest, and is much more accessible. The climate varies with the elevation, from the tropical heat of the coast, which is often fever stricken, to the temperate and healthy air of the plateau, and the cold of the mountain heights. In the plateau of San José, the N.E. trade wind, prevailing from October to April, brings dry weather; from April to October, the S.W. monsoon, blowing up from the Pacific, brings almost daily rain, excepting within a remarkable period of about a fortnight of dry weather in June, called the "Veranillo de San Juan." The rainfall at San José (3,872 feet above the sea) averages from 40 to 60 inches annually; the average temperature here is about 68° F., rising to 76° in the hottest month of summer and falling to 55° F. in the coldest. The country is subject to earthquakes; a very severe one, occurring in 1841, destroyed the town of Cartago. *C. R.* is exceedingly fertile, its forests being filled with an immense variety of timber trees and useful dye-woods, such as mahogany, ebony, India-rubber, Brazil-wood, and oak; almost all the fruits of the tropical and temperate zones are found to thrive, and flowering plants are in rich profusion. Coffee is the staple cultivated product of the country, and is grown chiefly on the plateau lands of San José and Cartago, — the special adaptability of these to the growth of this plant being attributed to the nature of the soil, which consists of layers of black or dark-brown volcanic ash of from 1 to 6 yards in depth. Rice, maize, barley, potatoes, beans, bananas, and yucca are also cultivated to some extent in the interior; cocoa, vanilla, sugar-cane, tobacco, cotton, and indigo, on the warm coast lands, but as yet only for home consumption. About 1,150 sq. m. of the country are under cultivation. As yet the chief highway of *C. R.* is the wagon-road from Punta Arenas on the Gulf of Nicoya, virtually the only port of the country, to the capital of San José, and thence to Cartago on the central plateau. Mule-tracks lead N.W. from Punta Arenas through the prov. of Guanacaste to Nicaragua, from San José N.E. by the valley of the Sarapiqui to Grey Town on the Atlantic, from Cartago E. to Puerto Limon, also on the Atlantic, and S. over the W. spurs of the Montaña Dota to the plains of Terraba. A railroad from Alajuela to the capital and through Cartago to Puerto Limon, part of a proposed inter-oceanic highway, was begun in 1871, and in December, 1873, the portion between Alajuela and Cartago, 42 miles, had been completed. Owing to financial difficulties, however, the work ceased in 1874, and only sufficient hands were employed to keep the part finished in working order. 200 m. of telegraph line had been completed in 1878. There are no manufacturing industries in *C. R.* The country is rich in minerals, — gold, silver, copper, iron, nickel, zinc, lead, marble, — but up the present time gold, silver, and copper are the only ores that have been worked. The principal gold mines are (1) those of Trinidad, 4 leagues inland from Punta Arenas, 1,200 feet above the sea, worked on a small scale by a *C. R.* company, — the quartz yields gold of a fineness of about 17½ carats; and (2) the mines of the Cerro del Aguacate, one of which is worked by the native "Compania de la Montaña del Aguacate," also in an imperfect manner, but with good results. Another, called the "Sacra Familia," lies a little N. of the Aguacate mine, at an elevation of 3,000 feet above the sea; it has two chief veins, one containing galena and zinc blend, with silver, and gray copper ore also yielding silver, and a second, with a lode of gold quartz similar to that of Trinidad. This mine is also worked on a small scale by private individuals, and gives gold of about 15½ carats fine. Gold is said, also, to exist in the wild Indian country of the Atlantic slope, but the position of the supposed mines is uncertain.

The total exports of *C. R.* for the year 1877 amounted to $5,307,406, of which $5,007,406 were shipped from Punta Arenas (pop. 1,800) on the Pacific. Only a small part of the trade of the republic passes through Puerto Limon on the Atlantic, to which there is a mule-track, the bulk of goods being carried round to the Pacific port of Punta Arenas, whence there is a highway to the interior. The chief articles shipped from the former port were: — coffee, 24,300,000 lbs., worth $4,859,154; deerskins, $64,533; India-rubber, $36,230, and farina, $15,421. The commercial intercourse of *C. R.* is chiefly with England; but trade with the U. States is slowly increasing, notwithstanding the great facilities afforded to the English trade by the Royal Mail Steamship Co., whose steamers touch at Atlantic Central American ports. San Francisco is doing an extensive trade with Central America, chiefly with *C. R.*, that city being, next to London, the most favorable market for the *C. R.* coffee. But for this trade between California and Central America, the commercial intercourse of the U. States with that part of America would sink into utter insignificance. Our trade with *C. R.* is not reported on in the "Annual Statements," published by the Chief of the Bureau of Statistics of the U. States, which throws the statistics of *C. R.*, together with other States, under the general heading of "Central America." For the value of imports and exports thus given, see *Guatemala*.

Finances. The revenue of the republic, derived from customs, monopolies of spirits, and tobacco, from the national bank, sales of land, and various taxes, chiefly that on the exportation of coffee, amounted in 1877 to $2,379,432; the expenditure in the same year was $2,512,972, showing a deficit of $133,540. In 1871 the government contracted in London a loan of $5,000,000, and in 1872 another of $12,000,000 for the construction of an inter-oceanic railway. In 1877 the external debt from this source was $12,503,000. Of this sum $5,580,000 had been spent on the railroad previous to the close of 1873, when the further execution of the work ceased. The interest and sinking-fund of this loan are far in arrears; the country is bankrupt, and the government has made no attempt to pay even part of its liabilities.

Money, Weights, and Measures. See GUATEMALA.

Costermonger, the English name for an itinerant hawker or street dealer; originally costardmonger, one who sold apples, but now applied indiscriminately to hawkers of fruit, vegetables, fish, etc.

Costume, a term usually applied to a fancy or character dress.

Costumier, a dealer in fancy dresses.

Costus, a name for the putchuk root, a kind of Indian orris, obtained from *C. Arabicus*, used in China as an incense.

Cote [Fr.], the quotation in a prices-current.

Cote-Rotie, a red wine grown near Lyons, which ranks as one of the best in France. The quantity produced of the very best quality is small, rarely exceeding 250 hectolitres. It is remarkable for the excellence of its color, for clearness, strength, and perfume; at the nose it has the sweet odor of the violet. It is very slightly bitter. When not aged, it is a little heady, and is much improved by a voyage. Its alcohol is about 12.32 per cent.

Cotgare, refuse wool, hemp, or flax.

Cotillon, a woollen material, made of various colors, for ladies' skirts.

Cotogno [It.], the quince-tree.

Cotswold-Sheep, a long-wooled breed of English sheep, so named from the cots or sheds in which they were housed, which at one time were peculiar to the counties of Gloucester, Hereford, and Worcester.

Cottah, an Indian land measure, the 20th part of the beegah or biggah; equal in Bengal to 720 sq. feet.

Cotton [Fr. *coton;* Ger. *Baumwolle;* Hindus. *rûhi;* It. *bambagia, cotone;* Port. *algodao;* Sp. *algodon*], a vegetable hair, or filamentous down, enveloping the seeds of different species of *Gossypium,* a plant growing in warm climates, and indigenous to India and America. It is produced within pods which protect it from injury by dust or weather, until it is ripe and fit to be gathered, when the heat of the sun causes it to expand and burst open the pod. It is of a white or yellowish-white hue, possesses downy softness and warmth, and its delicate fibres are sufficiently long, flexible, and tenacious to admit of being spun into a fine thread. The usual distinctions of the plant are, 1st, *Tree C.*; 2d, *Shrub C.*; 3d, *Herbaceous C.*; of each of which there are several kinds, — the plant having a great tendency to run out into varieties. — 1st, Tree *C.* (*G. arboreum*) (Fig. 110) is found in India,

Fig. 110. — Cotton-Tree.

China, Egypt, the western coast of Africa, and in some parts of America. It only attains the height of from 12 to 20 feet; but another cotton-bearing tree [*Bombax ceiba*), seen in the West Indies and elsewhere, called familiarly the *umbrella tree,* attains the height of 100 feet. The produce of the latter, however, is of so short and brittle a fibre, that it is unfit for spinning or any other purpose, except stuffing pillows and beds. — 2d, Shrub *C.* (*G. religiosum*) occurs in one or other of its varieties throughout the tropical parts of Asia, Africa, and America. In appearance it resembles a currant-bush. Its duration varies according to the climate; in the hottest countries it is a perennial, while in cooler places it becomes an annual. In the former, two crops a year are gathered, one from October to December, the other from February to April. The Guiana, Brazil, and most of the West India *C.* is of this kind; the whole being also long-stapled. — 3d, Herbaceous *C.* (*G. herbaceum*), by far the most useful and important of the three kinds we have noticed, is an annual plant cultivated in the United States, India, China, and many other countries. It attains the height of 18 or 24 inches. The seed is usually planted in rows in March, April, and May; and the cotton is gathered by hand, within a few days after the opening of the pods, in August, September, and October. It is to this kind that the planters confine their attention in this country. In places where *C.* is most extensively cultivated, the following varieties are commonly distinguished: 1st, *Nankeen C.*, abundant in produce, the seed covered with down, the wool of a dirty yellow color, and usually low priced. 2d, *Green-seeded C.*, which, as well as the former, is grown in the upland and middle districts, whence the latter is called *upland,* also *short-staple,* and, from the mode in which it was formerly cleaned, *bowed Georgia C.* This kind was at first chiefly raised in Georgia and S. Carolina, but in later years it has been very greatly extended in Alabama, Mobile, and the Valley of the Mississippi. 3d, *Sea-island* or *Long-staple C.*, the finest of all, is distinguished by the black color of its seed, and the fine yellowish-white, strong, and silky long-staple by which it is surrounded; it is grown in the lower parts of Georgia and S. Carolina, near the sea, between Charleston and Savannah, and on small islands adjoining the shore. Owing to the peculiar combination of circumstances requisite for the production of this kind, it forms only a trifling proportion of the *C.* grown in the U. States; nor is the quantity on the increase. — All the varieties of the plant require a dry and sandy soil. Marshy ground is wholly unfit for it, and a wet season is destructive to the crops, which are besides precarious from the diseases to which the plant is subject, particularly blight produced by wetness at the roots. In general, it flourishes most luxuriantly, and yields produce of the best quality, on the coast, as is proved by the growth of the sea-island *C.*, which is mostly exposed to the action of the ocean's spray; and a manure of salt mud is known to impart a healthful action to the plant, and to produce a staple at once strong and silky. To this rule, however, the fine Pernambuco *C.* is an exception; also the Egyptian, the growth of the upper provinces being greatly superior to that of the Delta. In the U. States, the average yield of *C.* is about one bale for three acres, this rate of yield being sustained in the East by fertilization, while it is kept up in the West by opening fresh land.

There is no portion of the world occupied by civilized nations, and probably no equal extent of the earth's surface, so peculiarly suited to *C.*-culture as the States of the Gulf coast. There are large areas with the requisite soil and the high temperature required, but with these essentials the necessary degree of humidity is rarely combined in so complete equilibrium. It constitutes an advantage which virtually gives the monopoly of *C.*-production to the U. States. The policy of Great Britain has ever been to obtain a controlling proportion of raw material for her manufacturers from her own colonies, and to this end her Cotton Supply Association has searched the world over for *C.*-fields that would make her independent of this country. This is a natural and laudable ambition, a means of self-protection, and the highest measure of "protection" she could institute; for while she commends free trade to other nations, she finds in it the highest form of protection, precisely as she built up her manufacturing system by restrictive duties up to a period when the opposite policy tended to secure a continuance

of the superiority thus wisely gained. When debarred from our C. fields by civil war, the receipts from India were increasing under the stimulus of this self-protecting effort; yet with a C. famine in Manchester, and starvation threatening the spinners, the increase from 369,000,000 lbs. in 1861 to 506,000,000 lbs. in 1864 was less than the advance from 1857 to 1861. In the very first year of peace in this country these imports declined one eighth, though they rallied in 1866 to 615,000,000, the highest figures ever attained, and rapidly declined afterward to less than half that quantity. In 1858 and 1860 the receipts from America constituted four fifths of the British imports. In 1863 they amounted to a fraction of 1 per cent; in 1864, 1½ per cent, and in 1862 but 2½ per cent. Starting at 37 per cent in 1866, in 1876 the proportion reached 62 per cent, and the proportion of India cotton had fallen to 18⅔ per cent. The price, as an index of quality, tells the story of India's inability to compete with the U. States. The average value per pound, in pence, of British imports, is thus given: —

	1872.	1873.	1874.	1875.	1876.
Cotton of the U. States....	9 9	9 1	8	7 7	6 4
Cotton of India..	7	6.4	6	5 7	5.1

American seed and American planters have in vain been introduced into India; the fibre inevitably deteriorates, becomes short, dry, harsh, and brittle, with a low rate of yield.

The progress in C. production, like that of many other industries in this country, is westward. In 1849 Alabama stood in the front rank, with 22.8 per cent of the crop, and Georgia ranked next, with Mississippi following closely. Scarcely an eighth of the crop was produced west of the Mississippi. In 1869 about three tenths of the product came from beyond the Mississippi. N. Carolina had declined from 2.9 to 2.7 per cent, S. Carolina had fallen from 12 to 6.4, and Georgia from 19.8 to 13. Louisiana had advanced from 7.2 to 14.4, and Arkansas from 2 2 to 6.8. At the present time more than three eighths of the crop is grown W. of the Mississippi, Texas making rapid strides, evidently destined soon to lead the column of C. States. The following statement gives the percentages of the crop produced by each State, as deduced from the census, with the estimated proportion in 1878: —

States.	1849.	1859.	1869.	1878.
North Carolina.........	2.9	2 7	4.8	4 7
South Carolina..........	12	6 4	7 4	7 0
Georgia..................	19 8	13	15 7	11.4
Florida..................	1.01	1.24	1 3	1.13
Alabama.................	22.8	18 3	14	12
Mississippi..............	19.5	22.3	18 7	17 1
Louisiana...............	7.2	14 4	11 6	12 5
Texas....................	2 3	8	11 6	15.5
Arkansas................	2 2	6 8	8 2	11.3
Tennessee...............	7 8	5.5	6	5.8

Quantities of Raw Cotton produced, imported, exported, and retained for Consumption in the U. States, from 1849 to 1878, inclusive.

Year ended June 30—	Annual Crop. Production.	Annual Crop. Average net weight of bale.	Annual Crop. Production in pounds, gross weight.	Imported.	Total Production and Imports.	Exports, Domestic and Foreign.	Retained for home Consumption.	Percentage of Production and Imports retained for home consumption.	Percentage of Production, and Imports exported.
	Bales	*Pounds.*	*Pounds.*	*Pounds*	*Pounds*	*Pounds.*	*Pounds.*		
1849.......	2,808,596	436	1,306,020,727	157,276	1,306,178,003	1,026,749,167	279,428,836	21.39	78.61
1850.......	2,171,706	429	987,501,586	329,114	987,830,700	635,418,893	352,411,807	35.68	64.32
1851.......	2,415,257	416	1,005,031,726	157,757	1,005,189,483	927,237,089	137,952,394	12.95	87.05
1852.......	3,090,029	428	1,401,884,356	244,548	1,402,128,904	1,093,230,639	308,898,265	22.03	77.97
1853.......	3,352,882	428	1,521,135,505	722,628	1,521,858,133	1,111,612,892	410,245,241	26.96	73.04
1854.......	3,035,027	430	1,383,365,306	545,210	1,383,910,516	987,833,106	396,077,410	28.62	71.38
1855.......	2,932,339	434	1,348,993,233	2,115,367	1,351,108,600	1,008,424,701	342,683,899	25.36	74.64
1856.......	3,645,345	420	1,622,907,594	1,096,841	1,624,004,435	1,351,431,701	272,572,734	16.78	83.22
1857.......	3,056,519	444	1,438,520,102	802,233	1,439,322,335	1,048,282,475	391,039,860	27.17	72.83
1858.......	3,238,962	442	1,506,918,476	590,800	1,507,509,276	1,118,624,012	388,885,264	25.80	74.20
1859.......	3,994,481	447	1,892,664,987	743,500	1,893,408,487	1,386,738,676	506,669,811	26.76	73.24
1860.......	4,823,770	415	2,275,372,309	2,005,529	2,277,377,838	1,767,830,609	509,547,229	22.37	77.63
1861.......	3,826,086	477	1,934,545,603	881,371	1,935,426,974	307,634,242	....	....	....
1862.......	No record	during	the war period	29,640,853	....	5,198,230	....	....	....
1863.......	....	....	....	33,877,365	....	12,904,119	....	....	....
1864.......	....	....	....	26,475,957	....	13,420,146	....	....	....
1865.......	....	....	....	36,007,007	....	11,918,656	....	....	....
1866.......	2,228,987	441	1,041,962,263	6,276,887	1,048,239,150	651,921,489	396,317,661	37.81	62.19
1867.......	2,059,271	444	989,175,303	726,021	989,901,324	682,733,679	307,167,645	31.67	68.33
1868.......	2,498,895	443	1,173,431,114	514,992	1,173,946,106	785,415,226	388,530,880	33.10	66.90
1869.......	2,439,039	437	1,129,811,645	1,522,068	1,131,333,713	644,957,327	486,376,386	42.99	57.01
1870.......	3,154,946	434	1,451,401,357	1,698,133	1,453,099,490	958,785,304	494,314,186	34.02	65.98
1871.......	4,352,317	438	2,020,693,736	1,196,840	2,021,890,576	1,463,704,507	558,186,069	27.61	72.39
1872.......	2,974,351	439	1,278,084,494	2,894,183	1,280,978,677	933,825,710	347,152,967	27.10	72.90
1873.......	3,930,508	440	1,838,188,931	4,425,524	1,837,614,455	1,200,398,178	637,216,277	34.68	65.32
1874.......	4,170,388	439	1,940,648,351	3,625,830	1,944,274,181	1,358,979,913	585,294,268	30.10	69.90
1875.......	3,832,991	439	1,698,844,031	2,149,332	1,700,993,363	1,260,851,944	440,141,419	25.88	74.12
1876.......	4,669,288	436	2,157,958,142	2,451,419	2,160,409,561	1,491,629,831	668,779,730	30.96	69.04
1877.......	4,485,423	438	2,082,492,190	2,656,567	2,085,148,757	1,445,647,079	639,501,678	30.67	69.33
1878.......	4,811,265	452	2,305,173,286	3,032,013	2,308,205,299	1,608,469,052	699,736,247	30.31	69.69

Quantities of Raw Cotton of Domestic Production exported from the U. States to Foreign Countries, during the Eight Years, from 1871 *to* 1878.

Countries to which Exported.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Austria	2,164,845	....	1 378,852	....	....	....	....	1,818,151
Belgium	17,933,342	10,098,368	12,126,640	8,553,267	3,113,752	15,538,299	2,998,777	14,191,544
Denmark	....	....	....	....	....	....	....	....
France	59,611,304	88,187,183	113,370,036	177,365,583	155,139,454	203,975,759	219 088,761	236,030.981
Germany	103,986,223	42,516,604	95,342,287	114,613,646	75,284,980	108,545,768	77 605,283	121,649,103
England	1,053,595,339	675,251,638	814,071,799	875,337,752	878,442,263	920,917,121	967,117,624	990,734,163
Scotland	4.709,487	435,529	2,958,167	3,424,943	618,045	....	71,295	....
Ireland	44,017,517	28,227,598	41,619,365	24,809,077	32,881,451	36,412,618	53,176,517	49,214,262
Gibraltar	49,931	....	....	....	....	11,484	....	429,487
British W. Indies.	9,931	....	....	424,779	....	....	....	....
Canada, etc	2,393,083	1,896,077	1,494,142	4,011.077	3.561,511	4.980,616	5.508,304	7,082,535
Italy	21,457,495	5,922,224	15,283,998	12,298,366	9,041,936	23,379,304	11,547,892	18,110.597
Mexico	11.309,498	957,209	550,639	2,289,561	1,305,276	6,972,575	3.969,812	3,422,162
Netherlands	55,702,817	22,784,985	19,086,112	19,004,316	4,070,675	34,265,719	26,855,697	27,954,214
Portugal & Pos'ns.	173,068	442	....	....	4,990	....	....	733,667
Azore, Madeira, etc	....	....	416	425	1,000	1,057	....	....
Russia	31,135,476	24,683,546	49,573,330	54,090,632	65,708,178	80,896,983	25,109,482	85,428,896
Spain	47,155,961	32,570,783	27,722,241	53,359,064	29,813,227	47,561,153	46,030,632	40,685,242
Cuba	....	768	....	....	....	449,607	387,756	....
Sweden and Norway	6,886,874	....	5,457,506	9,019,815	1,432,165	7,497,271	6,601,298	10,043,697
Turkey in Europe.	....	....	....	....	....	....	....	....
S. American ports.	4,250	4,459	....	....	....	....	....	....
All other ports n. e. s.	631,583	....	28,000	....	....	....	....	4,810
Total	1,462,928,024	933,537,413	1,200,063,530	1,358,602,303	1,260,418,903	1,491,405,334	1,445,369,130	1,607,533,511

The manufacture of *C.* has been carried on in Hindostan from the remotest antiquity, but the employment of *C.* for textile fabrics obtained no footing worth mentioning in Europe till last century. From the first introduction of the *C.* manuf. in England (probably in the early part of the 17th cent) down to 1773, the weft or transverse threads of the web, only, were of *C.*; the warp, or longitudinal threads, consisting wholly of linen yarn, was principally imported from Germany and Ireland. In the first stage of the manuf. the weavers, dispersed in cottages throughout the country, furnished themselves as well as they could with the warp and weft for their webs, and carried them to market when they were finished; but about 1760 a new system was introduced. The Manchester merchants began about that time to send agents into the country, who employed weavers, whom they supplied with foreign or Irish linen yarn for warp, and with raw *C.*, which being carded and spun, by means of a common spindle or distaff, in the weaver's own family, was then used for weft. A system of manuf. was thus established; the junior branches of the family being employed in the carding and spinning of the *C.*, while its head was employed in weaving the linen and *C.* yarn into cloth. This system, by relieving the weaver from the necessity of providing himself with linen yarn for warp and raw *C.* for weft, and of seeking customers for his cloth when finished, and enabling him to prosecute his employment with greater regularity, was an obvious improvement on the system that had been previously followed; but it is at the same time clear that the impossibility of making any considerable division among the different branches of a manufacture so conducted, or of prosecuting them on a large scale, added to the interruption given to the proper business of the weavers by the necessity of attending to the cultivation of the patches of ground which they generally occupied, opposed invincible obstacles to its progress, so long as it was conducted in this mode. In 1767, however, James Hargreaves invented the *spinning-jenny*. At first this admirable machine enabled 16 to 30 threads to be spun with the same facility as 1; and it was subsequently brought to such perfection, that a little girl was enabled to work no fewer than from 80 to 120 spindles. The jenny was applicable only to the spinning of cotton for weft, being unable to give to the yarn that degree of firmness and hardness which is required for the longitudinal threads, or warp; but this deficiency was soon after supplied by the introduction of the *spinning-frame* (1769–1775), — that wonderful piece of machinery which spins a vast number of threads of any degree of fineness and hardness, leaving to man merely to feed the machine with cotton, and to join the threads when they happen to break. Sir Richard Arkwright gave his machine the name of the *water-frame;* but it has since become known as the *spinning-frame.* Nearly at the same time that the spinning department was thus wonderfully improved, Dr. Cartwright, a clergyman of Kent, invented the *power-loom* (in 1787), a machine which has already gone far to supersede weaving by the hand. While these extraordinary inventions were being made, Watt was perfecting the steam-engine, and was thus not only supplying the manufacturers with a new power applicable to every purpose, and easy of control, but with one that might be placed in the most convenient situations, and in the midst of a population trained to industrious habits. Still, something remained to complete this astonishing career of discovery. Without a vastly increased supply of the raw material at a lower price than it had previously brought, the inventions of Hargreaves, Arkwright, and Watt would have been of comparatively little value. Luckily, what they did for the manufacturers, Mr. Eli Whitney, originally of Massachusetts, and afterwards a citizen of New Haven, Connecticut, did for the American *C.*-growers. His invention of the *saw-gin*, which came into operation in 1793, forms an important era in the history of the *C.* trade. This invention, by which one man can separate 3 cwt. of *C.* in a day, has been the main cause of the cheapness of the short-stapled American *C.*, and thus has powerfully contributed to the extension of its cul-

tivation. In consequence of these and innumerable other inventions and improvements, the prices of C. cloth and yarn have gone on progressively diminishing. But as the demand for C. has been, owing to its extraordinary cheapness, extended in a still greater degree, the value of the goods produced, and the number of persons employed in the manufacture, have been steadily increasing. The first machines set up in the U. States were at East Bridgewater, Mass., in 1786, by two Scotchmen, employed by Mr. Orr of that place. The manufacture, however, languished for want of competent machinery until 1790, when a person named Slater, who had been employed in the English cotton-mills in Derbyshire, and had there acquired a knowledge of the Arkwright processes, established himself, in conjunction with partners, at Providence, R. I. In 1806, Slater's brother came over from England, and joined him; when they at once started business at the village of Slatersville in the same State, and gave an extraordinary impetus to the manufacture, which, by 1816, had increased to the consumption of about 100,000 bales of the raw article, turning out 81,000,000

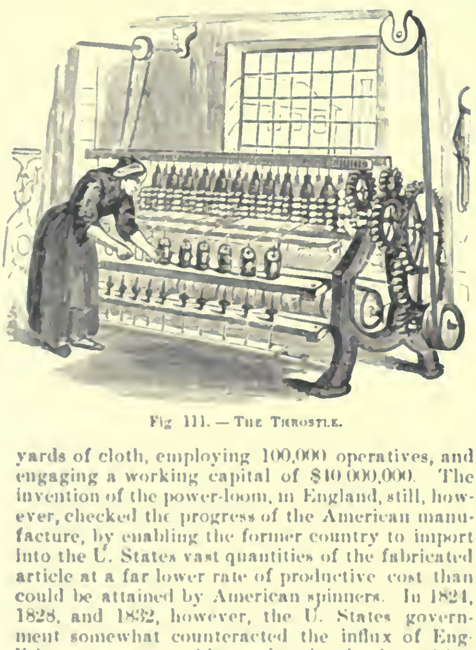


Fig 111. — The Throstle.

yards of cloth, employing 100,000 operatives, and engaging a working capital of $40,000,000. The invention of the power-loom, in England, still, however, checked the progress of the American manufacture, by enabling the former country to import into the U. States vast quantities of the fabricated article at a far lower rate of productive cost than could be attained by American spinners. In 1824, 1828, and 1832, however, the U. States government somewhat counteracted the influx of English cottons upon this market, by the imposition of an *ad valorem* duty of 25 per cent upon the foreign commodity. In 1812, Mr. Francis C. Lowell of Boston, who had in Great Britain acquired some knowledge of Mr. Cartwright's power-loom, returned to this country, and immediately set about introducing its operations, on an extensive scale, at Lowell, Mass. The first C.-mill on the power-loom principle was established there in 1822, — the nucleus of a system of manufacturing operations, which, in 1852, had accumulated to 51 mills, giving employment to 12,633 hands. The manuf. is no longer confined to the State of New York and the New England States, though in these it has been greatly extended. In other Northern States, such as New Jersey, Pennsylvania, Delaware, Maryland, Ohio, and Indiana, new mills have been erected; whilst in the Southern States, especially in Alabama, Georgia, N. and S. Carolina, Mississippi, Virginia, etc., the manuf. as well as the growth of C. has become an important industry. The number of spindles, which was 5,235,727 in 1860, and 7,132,415 in 1870, is now estimated at 10,100,000. The amount of capital invested in the trade was $98,000,000 in 1860, $141,000,000 in 1870, and $208,000,000 (estimated) in 1878. Our exports of manufactured C. for the 9 years, 1870 to 1878, were as follows: —

	Colored.		Uncolored		Other manuf. of.	Total.
	Yards	Dollars.	Yards	Dollars	Dollars	Dollars.
1870	6,984,715	1,035,489	8,276,984	1,345,998	1,405,923	3,787,234
1871	5,051,025	724,841	14,852,361	1,776,984	1,066,944	3,558,148
1872	2,841,888	458,306	8,820,191	1,317,719	525,611	2,304,530
1873	3,585,026	802,915	10,187,145	1,035,116	626,390	2,947,528
1874	4,025,180	625,761	13,297,142	1,091,280	745,590	3,093,840
1875	7,263,725	880,061	21,224,059	2,313,270	819,331	4,071,862
1876	16,498,214	1,455,402	30,313,257	5,314,759	952,778	7,722,938
1877	29,601,304	2,484,171	76,708,147	6,475,233	1,314,480	10,273,953
1878	37,763,313	2,030,910	88,528,152	7,053,462	1,425,292	11,435,990

Of the total exports for the year 1878, 22.40 per cent was exported to China, 13.75 per cent to Great Britain, 11.39 per cent to Mexico, 10.82 per cent to the Dominion of Canada, and 11.64 per cent to almost all other countries of the world.

The value of imports of C. goods into the U. States (mostly from England and France) for the year 1878 was as follows: —

Bleached and unbleached (9,675,594 sq. yds.)	$1,076,142
Printed, painted, or colored (8,335,123 sq. yds.)	1,086,426
Hosiery, shirts, and drawers (almost all from England)	4,682,246
Jeans, denims, drillings, etc. (325,328 sq. yds.)	104,633
Other manufactures	12,131,590
Total	$19,081,037

It is a noticeable fact that English commercial writers, in commenting upon our exports of C. manuf., have congratulated themselves that, so far as they were concerned, nothing was to be feared from our C. manufacturing industry in competition with theirs in supplying the great markets of the world; their reasons being based upon the theory that all of the increased exports of C. goods from American ports were owing to the depressed state of the home demand for those goods. That this was in great part the truth cannot be denied. But it is every day becoming apparent that the movement to relieve the home market by forcing, so to say, our goods upon foreign markets, is now resulting in creating a large and legitimate demand for the products of our looms and spindles. We grow the C. on our own soil; and we have the genius, capital, skill, labor, and machinery to weave it into fabrics that will cause them, by their intrinsic merit and excellence, to become the staple goods of other lands as they are now in our own. We are therefore fully prepared to compete with England, in all respects, in supplying the world with C. manufactures. And the results of past years show that American C. can be sold over the counters of London, and even at Manchester, at the very doors of English spinners. It is a well-known fact that our calicoes and gray cloths are sent to Manchester and continental points, and from there are transshipped to other countries under English and German brands. It is well known, also, that our C. goods are sent to Liverpool in large quantities, and from there are sent to Cuba and the West Indies. Mexico and the S. American countries are developing an increased trade with us in these goods, with a fair promise that it will ultimately become of great magnitude. China and Japan prefer C. of American manuf. to those of English make, because of their superior fabric and quality, and for their freedom from clay sizing, an adulteration

for which the English manufactures are noted. From 1868 to 1875 probably 40 per cent of the C. machinery set up anew was imported, the capacity of the home machine shops being not then sufficient to supply the sudden demand for new and enlarging mills. During the following years 75 per cent, or more, has been made at home. The home shops build all kinds of machinery used in cotton-mills, and can put any portions of it, except perhaps mules and roving-frames, into the home mills at a cost less than the cost of importation from England. Home-built machinery of nearly all kinds is preferred to that from England as better adapted to American operatives and management.

C. Manufacture. When the pods have been collected from the plants, they comprise seeds as well as fibres: and as the latter cannot be spun into thread until the former have been removed, this removal is practically the first stage in the manuf. It is always done, more or less completely, in the country where the C. is grown, and is called *ginning*. In India the natives have for ages used a single machine called a *churka*, consisting of two small wooden rollers so placed as to revolve in contact. The dirty C. is put in at one side between the rollers, the seeds fall down in front, because they cannot pass through; and then the comparatively clean fibres are pushed out at the other side. The want of care in weeding the crop while growing, in picking it when ripe, and in ginning it when picked, is one of the reasons why Indian C. never commands so good a price in the market as American. In this country long-stapled C. used to be *bowed*, or struck with a kind of bowstring plucked with the fingers, to open the tufts. It is now more usually subjected to the action of a wooden roller and a kind of comb. But short-styled C. requires to be *ginned*, or torn open with some degree of force, to extricate the seeds Whitney's *saw-gin* is a vast improvement on the Hindoo churka. It comprises a series of circular saws, mounted on a frame, and turned by a fly-wheel; nearly in contact with it rotates another cylinder, mounted with brushes; and the C., drawn in between the two, is deprived of its seed by the action of the saw-teeth against the brushes. The improved *Macarthy gin* is by far the most complete machine for this purpose. After travelling along an endless apron, the C. is seized by a spiked roller, partially opened, and transferred by a vibrating comb to other rollers studded with blades So numerous are the novelties introduced every year into C. machinery that we will not here attempt even a summary description of them. The following will, however, give a fair notion of the order of processes now generally followed, varied in detail in different establishments. — *Sorting*. An experienced sorter, as soon as the bags are opened, examines and separates, classifies and mixes, according as the cotton is wanted for coarse or for fine yarns. Much of the success of the manufacture depends upon this sorting. — *Opening*. The C, after sorting, is spread out upon an endless apron of narrow wooden laths, which carries it forward horizontally to the *opener*, where fluted rollers, and cylinders armed with rows of teeth, revolving 1,000 times or more per minute, tear open the tufts of cotton, and convey them onward in a cleaned condition. — *Scutching* A *scutcher*, comprising feed-rollers and toothed cylinders, receives the opened C. at one end, and drags or combs it out into a flat layer, which becomes thinner and thinner, and more and more even and regular, at each movement. This thinning of the layer or fleece results from the last pair of cylinders revolving more rapidly than the first. Processes of *willowing* and *batting* are sometimes employed instead of *opening* and *scutching*. — *Lapping*. Sometimes in the same machine as the opening, sometimes in a subsidiary apparatus called the *lapping-machine*, or *lapper*, the C. is converted from the form of a fleece to that of a roller, or lap; the fleece, subjected to three or four compressions by rollers, is narrowed and coiled up on a sort of flat roll. — *Carding*. The *carding-engine* has cylinders clothed with fine wire teeth, so arranged that when the laps of C. are drawn between them, the teeth drag opposite ways, comb and straighten the fibres, and rub off some of the impurities which attach to them. The best engines of this kind have an apparatus for cleaning the teeth and carrying off the dirt and fragments. The fleece becomes a ribbon or sliver of fine downy substance. — *Drawing*. Several slivers are passed through four pairs of rollers in the *drawing-frame*; they all become combined into one, and are at the same time drawn out or attenuated. The C. is now a loose porous cord of parallel fibres. — *Slubbing*. The *slubbing-frame* contains numerous upright steel spindles, on which rotate steel arms or flyers and wooden bobbins; and it has also a set of rollers. The apparatus is so contrived that the porous cord, as received from the drawing-frame, is still further elongated and attenuated, partially spun or twisted, and wound upon the wooden bobbins. — *Roving*. The *roving-frame* so far resembles the slubbing-frame as to have rollers, spindles, and bobbins; and the object of the roving process is to combine two or more slubbings together by further rolling, twisting, and winding upon smaller bobbins. The C. assumes more and more the condition of a thread, though still having very little hardness or compactness. — *Spinning*. The bobbins full of prepared roving are placed on the top of the *throstle-spinning* (Fig. 111). Rollers and bobbins and flyers draw out the fibres, elongating and attenuating them, and at the same time twisting them tightly into a compact yarn, well adapted for the warp or long threads of woven goods. In the technical language of a C. mill, the throstle is used for the hard coarse yarns up to about No. 40. For fine work, the *mule-jenny* (Fig. 112) is used. In this mule action the bobbins containing the rovings are on a fixed frame; the spindles by which the rovings are to be twisted into yarn are on a movable frame; the movable frame, by travelling 4 or 5 feet outward, then an equal distance backward, and so on alternately, stretches and attenuates the threads. The two sets of operations, elongating and spinning, succeed each other with exquisite regularity; 600 or 700 threads, all arranged parallel, being managed by self-regulating mechanism. *Mule* yarn, as it is technically called, being twisted more softly and carefully than *throstle* yarn, is suitable for the weft or cross-threads of coarse goods, and for both warp and weft of fine goods. — *Reeling*. The C. having been spun, we have next to follow the yarns through the various processes incident to weaving into calico, muslin, etc. The first of these is *reeling*. The reel is a sort of six-sided frame, several feet long, revolving on a horizontal axis. The bobbins and cops are so placed in rows that the yarn unwinds from them, and winds itself upon the reel. 120 yards thus wound are called a *rap*, and 7 raps, or 840 yards, make a *hank*. Each hank is removed as wound, and tied so as to keep in place. — *Bundling*. In order that the hanks may be conveniently packed for sending to market, they are squeezed in a *bundling-press*. All hanks are the same length, 840 yards; all are weighed by the same unit of weight, 1 lb.; and the number attached to each kind denotes the number of hanks of that kind which go to a pound. Usually about 10 lbs., of whatever number or fineness, are pressed together to form a *bundle*; and from thirty to forty of these bundles are pressed together into a *bale*, which then weighs from 300 to 500 lbs. — *Winding*. But the yarn may be woven into cloth in the same mill where it has been spun. In this case the reeling and bundling are dispensed with, and the yarn goes at once to the *winding-machine*. This is an assemblage of rollers and other mechanism by which the yarn is unwound from the spindles and cops, passed through minute slits or openings that will scrape off roughnesses and inequalities of surface, then passed under the action of brushes which clear it of dirt, and finally wound on bobbins. — *Warping*. The yarn is now, for the first time, to be brought into parallel threads, the first germs of the *warp* of cloth. The *warping-machine* employed is so constructed as to unwind the yarn from the bobbins, and wind it round a large roller, with as much parallelism as possible and an equable degree of tension. — *Sizing* or *Dressing*.

Fig. 112. — Mule-Jenny.

C. is never woven in its natural state. It always receives a dressing or coating of some kind of liquid size, which is allowed to dry before the weaving begins. The object is to diminish the roughness on the fibrous surface of the yarns, and thereby facilitate the weaving. The yarns from several rollers are unwound and made to pass through a vessel of hot liquid size, and then between rollers which squeeze the glutinous composition into the very heart of the thread. Thence the yarns pass over *drying cylinders*, made of sheet iron or copper, heated within by steam-pipes. This quickly dries the size, and prepares the yarn to be wound upon the *weaver's beam*, a roller which receives uniform layers from end to end — *Weft Winding*. The *beaming* is for the warp threads, the *winding* for the weft. The yarn for the weft, usually softer and finer than for the warp, is placed in the shuttle. (See SHUTTLE.)— *Weaving*. Then comes the actual weaving process, for which we refer to LOOM and WEAVING. — *Folding*. When the *C.* cloth has been woven, it winds itself upon a roller called the *cloth beam*, which is then taken to the *folding-machine*, by which the cloth is unwound, measured, and folded with great precision — *Pressing into Bales*. Whether the cloth is to be sold in the gray or unbleached state, or whether it is to be bleached (with or without subsequent dyeing or printing), it is removed from the folding-machine to the *hydraulic press*, where it is compressed into compact bales of definite size, the weights of which are made to suit various markets. See BLEACHING, CALICO-PRINTING, DYEING, FUSTIAN, MUSLIN, etc.

Import Duties on Raw and Manufactured Cotton.

Cotton, raw, free
" on spools, not over 100 yds. per spool, 6 cts. per dozen and 35 per cent
" on spools, over 100 yds. per spool (each additional 100 yds.), 6 cts. per dozen and 35 per cent.
" thread, yarn, warp or warp-yarn, not wound upon spools, single or advanced beyond the condition of single by twisting two or more single yarns together, whether on beams or in bundles, skeins, or cops, or in any other form, value not exceeding 40 cts. per lb., 10 cts. per lb. and 20 per cent.
" value over 40 cts., not over 60 cts. per lb., 20 cts. per lb. and 20 per cent.
" value over 60 cts., not over 80 cts., 30 cts. per lb. and 20 per cent.
" value over 80 cts. per lb., 40 cts. per lb. and 20 per cent.
" tissues (exclusive of jeans, denims, drillings, etc., for which see below) weighing over 5 oz. per sq. yd., not over 100 threads per sq. inch, warp and filling, unbleached, 5 cts. per sq. yd.
" bleached, 5½ cts. per sq. yd.
" colored, printed, painted, or stained, 5½ cts. per sq. yd. and 10 per cent.
" the same, exceeding 200 threads to the sq. inch, or, being finer and lighter than above, and not exceeding 200 threads, unbleached, 5 cts. per sq. yd.
" bleached, 5½ cts. per sq. yd.
" colored, printed, painted, or stained, 5½ cts. per sq. yd. and 20 per cent.
" jeans, denims, drillings, bed-tickings, ginghams, plaids, cottonades, pantaloon stuffs, and goods of like description, weighing over 5 oz. per sq. yd., and not exceeding in value 16 cts. per sq. yd., not over 100 threads per sq. inch, warp and filling, unbleached, 6 cts. per sq. yd.
the same, bleached, 6½ cts. per sq. yd.
the same, colored, printed, painted, or stained, 6½ cts. per sq. yd. and 10 per cent.
" over 100, and not over 140 threads per sq. inch, warp and filling, unbleached, 6 cts. per sq. yd.
the same, bleached, 6½ cts. per sq. yd.
the same, colored, printed, painted, or stained, 6½ cts. per sq. yd., and 15 per cent.
" over 140, and not over 200 threads per sq. inch, warp and filling, unbleached, 6 cts. per sq. yd.
the same, bleached, 6½ cts. per sq. yd.
the same, colored, printed, painted, or stained, 6½ cts. per sq. yd. and 15 per cent.
" over 200 threads per sq. inch, warp and filling, unbleached, 7 cts. per sq. yd.
the same, bleached, 7½ cts. per sq. yd.
the same, colored, printed, painted, or stained, 7½ cts. per sq. yd. and 15 per cent.
" goods, plain-woven, not included in the foregoing schedules, unbleached, valued over 16 cts. per sq. yd.; bleached, valued over 20 cts. per sq. yd.; colored, valued over 25 cts. per sq. yd.; and cotton jeans, denims, and drillings unbleached, valued at over 20 cts. per sq. yd., and all other cotton goods, value exceeding 25 cts. per sq. yd., 35 per cent.
" all bags, cotton-bags and bagging, and all other like manufactures, not herein otherwise provided, except bagging for cotton composed wholly or in part of flax, hemp, jute, gunny-cloth, gunny-bags, or other material, 40 per cent.

Cotton, bobbinet, 35 per cent
" braids, 35 per cent.
" caps, hose, leggings, mits, socks, made on frames, bleached or colored, 35 per cent.
" carpets and carpeting, 40 per cent.
" cords, gimps, galloons, braces, or suspenders, 35 per cent
" drawers, shirts, and other articles made on frames, 35 per cent
" embroidered or tamboured, in the loom or otherwise, by machinery or with the needle, or other process, 35 per cent.
" hat bodies, 35 per cent
" lace, insertings, trimmings, 35 per cent.
" velvets, 35 per cent
" waste, free
" manufactures not otherwise provided, 35 per cent.

Cottonade, cotton checks for men's wear, or heavy cotton fabrics for trousers, etc.

Cotton-Bagging, a coarse wrapping material for baling raw cotton, and for sacking. They are generally made of gunny-cloth.

Cotton-Bats, carded cotton in sheets, put up in rolls, usually of 1 lb.

Cotton-Broker, a commission merchant, whose regular occupation is to purchase or sell on samples cotton in the bale.

Cotton-Flannel, a term commonly used in the trade for Canton flannel.

Cotton-Floater, an india-rubber envelope or casing, in which bales of cotton are floated down rivers.

Cotton-Gin, a machine for clearing cotton-wool from the seeds, husks, and other impurities. See COTTON.

Cotton Goods, all manufactures of cotton. The term, however, is usually restricted to cotton piece-goods.

Cottonier, a name for the wild asparagus of Canada, the fibre of which is believed to be of importance as a substitute for flax and hemp.

Cotton Manufactures, all fabrics and goods generally manufactured from cotton.

Cotton-Mills, works where cotton-wool is spun by machinery into yarn, etc. There are about 900 cotton-mills in the U. States, of which 700 are in the Northern and 200 in the Southern States. The number of spindles at work in these mills is about 10,100,000. See COTTON.

Cotton-Picker. See PICKING.

Cotton-Press, a press in which cotton is baled for transportation. See PRESS.

Cottons, a general term for all kinds of closely woven piece-fabrics, light or heavy, bleached, unbleached, or printed, manufactured of cotton. It does not include cotton laces, bobbinets, and such like goods. — *T. McElrath.*

Cotton-Seed Oil. See OIL.

Cotton-Seed Oil-Cake, an oil-cake made from the pressed seeds of cotton, after the oil has been extracted, and used for cattle food and manure. Its price in New York varies from $20 to $35 per ton.

Cotton-Spinner, the owner of cotton works; also, a workman at a cotton-mill.

Cotton-Thread. See THREAD.

Cotton-Tick, a material for bed and pillow cases, etc., which is either plain or twilled, and sometimes composed partly of linen, as in union-tick.

Cotton-Topper, a machine which passes along and prunes the row of growing cotton-plants, in order to curb its rampant luxuriance. — *E. H. Knight.*

Cotton-Waste, the refuse from cotton-mills; a commercial article, classified as A No. 1 cop waste, and No. 1 cop; No. 1 white machine, and No. 2 do.; No. 1 colored, No. 2 do.; white bleached,

colored washed, strip and fly, and spinners' waste. The last-named is the least valuable, and generally sells for about one half the price of A No. 1 cop. The inferior cotton-wastes are called wadding-stock, willowed picker, oily card waste, and sweepings. *T. McElrath.* — The waste of cotton in spinning is about 1¾ oz. in a pound.

Cotton-Wood, the *Populus canadensis*, a forest tree of N. America, particularly abundant on the upper parts of the Mississippi and Missouri, and valued for its timber.

Cotton-Wool, a name given to cotton after it is cleaned.

Cotton-Yarn. See YARN.

Cotton-Yarn Measure, in the cotton trade, a thread is equal to 54 inches; a skein or rap of 80 threads, equal to 120 yards; a hank of 7 skeins, 840 yards; a spindle of 18 hanks, 15,120 yards.

Cottrel, a hook or trammel to hang a boiler or pot on for cooking purposes.

Couch, a frame on which barley is malted; a kind of sofa or long soft reclining seat.

Couching, in paper-making, the operation of taking the flake of pulp still imperfectly compacted from the mould on which it has been formed.

Coulage, the French term for leakage.

Coulisse, Cullis, a groove or channel; the gutter in a roof.

Counter, part of the stern of a vessel. — A table or bench on which money is counted. — Imitation money. — The back leather or heel part of a boot.

Countercheck, a plane for working out the groove which unites the two sashes of a window in the middle.

Counterfeit, a copy or imitation intended to be passed off as an original; a forgery.

Countermand, a contrary order; a stoppage *in transitu.*

Countermark, an additional or special mark put upon a package of goods belonging to several merchants, that it may not be opened unless in the presence of all.

Counterpane, Counterpoint, a bed-covering woven with little protuberances of various patterns. A more elegant species is the Marseilles quilts. These have a double cloth with a softer fabric quilted between them in the loom.

Counterpart, a copy or duplicate, as of a contract or indenture.

Counterpoise, a weight connected with an instrument or machine, either for the purpose of giving steadiness, or diminishing the pressure on some particular point; as, for example, the pressure of the pivots of a transit-instrument on its supports.

Counter-Security, security given to one who has become security for another.

Countersign, to authenticate by an additional signature.

Countersink, a bit or drill, for widening the upper part of a hole in wood or metal, for the head of a screw or pin, and having a conical head. Those for wood have one cutter in the conic surface, and have the cutting edge more remote from the axis of the cone than any other part of the surface. *C.* for brass have 11 or 12 cutters round the conic surface, so that the horizontal section represents a circular saw. These are called *rose.* The conic angle at the vertex is about 90°. *C.* for iron have two cutting edges, forming an obtuse angle.

Coup, a Scotch term for exchanging or bartering, buying and selling.

Coupe, a Swiss grain measure, in Fribourg equal to 7 gallons, in Geneva to 17.

Coupling-Box, a connection for joining the ends of shafts.

Couplings, the connecting link by which motion is added from one machine to another from the same motive-power; also, the rod or chain which unites railway carriages.

Coupon [Fr.], a warrant for payment of the periodical dividends on public stocks, a number of which, being appended to the bonds, are severally cut off for presentation as the dividends fall due. The practice of appending coupons to bonds prevails chiefly in reference to foreign stocks.

Courbaril. See ANIMÉ and COPAL.

Courier [Fr.], an express or special messenger.

Course, in masonry, a continuous layer or range of stones or bricks, placed even throughout the front of a building, horizontally.

Course of Exchange, the sum merchants pay to each other for bills to enable them to make remittances from one country to another.

Courses, the chief sails belonging to a ship, as the main-*course*, fore-*course*, etc.; to brail up the *courses.*

Courtage, the business or remuneration of a courtier, or broker, in France.

Courtier, the French name for broker.

Court-Plaster. See PLASTER.

Coury, a superior kind of catechu, said to be made in S. India from the areca or betel nut.

Cous-Cous, Couz-Couz, Kous-Kous, African names for the pounded grain of *Penicillaria spicata*, a species of millet.

Coutelier, the French name for a cutler.

Coutil [Fr.], canvas, ticking, drill, or duck.

Covado, a Portuguese cloth measure = 26¾ inches.

Cover, the movable top of anything.

Coverlet, a counterpane or quilt; the upper covering of a bed.

Covetta, or **Quarter-Round**, a plane used for moulding framework.

Covid, an Eastern cloth measure of variable length. In Calcutta and Bombay it is 18 inches; in Madras, 19$\frac{3}{8}$; in Arabia, 19; in Malacca, 18¼; and in China, 14⅝ inches.

Cow, the female of the bovine tribe of animals; a *Milch-cow* is a cow yielding milk. In 1878, there were in the U. States 11,300,100 milch-cows, valued at $298,499,866, the average price being $26.41. See CATTLE and DAIRY.

Cowan, a Scotch fishing boat.

Cowbeck, a mixture of hair and wool for hats.

Cowhage, Cowitch, a name given to the small hairs on the pods of *Mucuna urens* and *pruriens*, climbing plants of the East and West Indies. They are slender, brittle, easily detached, and readily stick into the skin, producing an intolerable itching. *C.* is used in medicine as a vermifuge, by being mixed with sirup till of the consistence of honey. *Imp.* free.

Cowhair, the hair taken from the hides of slaughtered cattle, which is used for various purposes, — for making rope, for stuffing, and for mixing with mortar. The white hair is employed in coarse blanket-making, and the brown hair by felt-makers, and for ships' sheathing, etc.

Cow-Heel, the foot of a calf or cow boiled for jelly.

Cowhide, the skins of cattle used for making leather, for rope, and for packing-bales, etc. — A whip made by twisting strips of the hide.

Cowl, a revolving chimney pot or cover to facilitate the escape of smoke.

Cowry, the shell of the *Cypræa moneta*, a small univalve found abundantly on the shores of the Maldives, Borneo, and the various islets of the Eastern Archipelago, as also on the eastern coasts of Africa. For many ages this shell has been used as a currency in parts of Hindostan and Africa, and the C. fishery was and perhaps still is the chief occupation of most of the natives who inhabit the islands where it is found. The nominal exchange of the C. in Bengal is at the rate of 640 to the anna (which is worth about 3 cents). In Siam they are still cheaper. But their value is far higher — at least 10 times — in Africa. Of course these rates are variable, and the delay of the C. ships used in India to raise the price greatly, so that occasion was taken to turn the C. trade into a gambling transaction. Since the abolition of the slave-trade, the supply of C. has become a matter of comparatively small importance.

Cowslip, the *Primula veris*, the flowers of which, when fermented with sugar, form a domestic wine used for wheys.

Cowsong, Coosong, a kind of nankeen dyed black; an article of trade in the Philippine and Sunda islands.

Coxswain, a steersman or chief boatman; one who has charge of a boat.

Coyan, a dry measure of common use in Asiatic and Eastern countries, containing more or less piculs, according to the articles measured and the locality. In some parts it is reckoned at 3,000 lbs. In Java it is 27 piculs, or 3,581 lbs avoirdupois; in Amboyna, 25 piculs, or 3,255¼ lbs.; in Singapore, 40 piculs of 133⅓ lbs. each.

Crab, a small portable crane or lifting-machine (Fig. 113), with a single or double purchase. — A capstan used by miners for raising or lowering pumps in a pit. — A well-known crustaceous animal (*Cancer pagurus*), common on our rocky shores, and brought to market both in a boiled and in a raw state. The animal is so tenacious of life that it does not lose its vital powers until two or three days after leaving the sea. May, June, and July are the months in which it is generally out of season. The male is of greater value than the female, and has larger claws. Before boiling, a good C. is known by the roughness of its shell, particularly on the claws. When boiled, its quality is known by holding the claws tight and shaking the body, which will rattle or seem as if water were in the inside if it be not in perfection.

Crab-Tree, the wild or ungrafted apple-tree (*Pyrus malus*). Its fruit is small, austere, and unpalatable, but loses much of its acidity under cultivation. The fruit of several varieties cultivated in this country is used for cooking and for making cider.

Crack, a flaw or fissure.

Cracker, a small, dry, hard biscuit, made of wheat flour, in various ways and forms. The manuf. of C. is the object of a considerable industry in this country. 14,392,231 lbs. of C., valued at $730,317, were exported in 1878, chiefly to the West Indies and South America. They are shipped in barrels or casks, packed in bulk, or in wooden, tin, or paper boxes.

Cracklings, the refuse of tallow when prepared by the chandler or candle-maker.

Cracknells, a kind of crisp sweet biscuit.

Cradle, a strong frame of timber, etc., placed under the bottom of a ship to conduct her steadily in her ways when being launched. — A child's cot, moving on rockers. — A gold-sifting machine. — A miner's name for a suspended scaffold used in shafts.

Cradle-Scythe, a rake or support to a scythe for receiving the straw as it is cut.

Craft, a trade. — A name given to small vessels.

Craftsman, a skilled mechanic or artificer.

Craig [Scotch], a rock or cliff.

Craig-Herring, a Scotch name for the shad.

Cramboo, a name in some parts of India for cloves.

Cramps, bent irons for holding things together; metal ties or holdfasts for securing large stones in a wall.

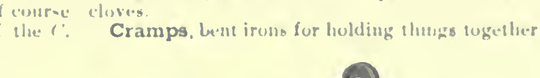


Fig. 113. — CRAB.

Cran, a fish measure, equal to about 37½ gallons; as many fresh herrings as will fill a barrel. — A name in the shoe-trade for any secret method of performing work.

Cranage, the money hire of a crane for loading and unloading ships, and warehousing goods.

Cranberry, the acid red fruit of a slender trailing kind of shrub, the *Oxycoccus macrocarpus*, which is indigenous to N. America, and extensively cultivated in New Jersey and other States. They are sown broadcast on wet land, and on drier soils the plants are drilled in and bear fruit the third year, yielding on the average about 150 bushels to the acre, which sell at 15 to 20 cts. the bushel. They are largely used for tarts and puddings, and are exported to England, preserved in spring-water.

Crane [Fr. *grue*; Ger. *Krahn*], a powerful lifting machine (Fig. 114), of great use on wharves and docks, etc., for hoisting goods. It consists of a vertical post rotating on its axis, and a projecting arm or jib over which the chain or rope passes in its way from the winch at the foot of the post to the load to be lifted. There are also double C. with two arms; one of which is employed in raising a load, while the other is depositing its load in position. Small iron C. are used at private stores

and warehouses, and on ships. — An iron support for a pot or kettle over a fire.

Crane's Bill, the *Geranium maculatum*, sold by herbalists as a styptic, astringent, and tonic. — Also a surgical instrument, consisting of a pair of long-nosed pinchers.

Crang, a name for the blubber or carcass of the whale.

Craniometer, an instrument for measuring the skulls of animals.

Crank, a rigid arm fixed at one extremity on a shaft perpendicular to its own axis, and receiving at the other an alternative impulse which causes it to revolve in a circle. It is the most usual mode of converting alternative, circular, or rectilinear motions into continuous circular motion, or vice versa:

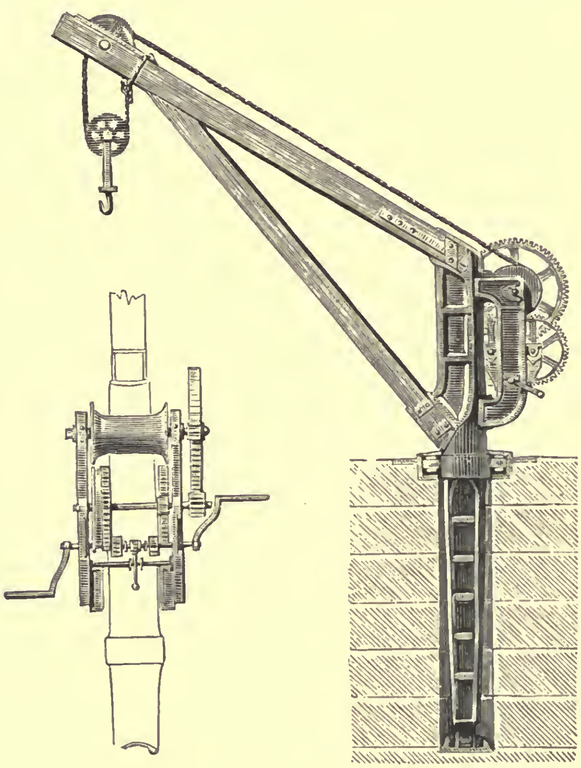


Fig. 114. — Crane.

and for this purpose the crank requires to be connected with the prime mover by a cord or a rigid rod. In building operations, it is used to change the direction of the motion of bell-wires, or other similar works. — A ship is said to be *crank*, when, by the form of the construction, or by want of a sufficient quantity of ballast or cargo, or by being loaded too much above, it is incapable of carrying sail without being exposed to the danger of oversetting.

Crank-Axle, a driving-axle.

Crank-Pin, the cylindrical piece joining the ends of the crank arms, and attached to the connecting rod, or, in vibrating engines, to the piston-rod; if the crank has only one arm, the pin projects from the end of it.

Crap, a name for buckwheat, darnel, etc.

Crape [Fr. *crêpe;* Ger. *Flohr;* It. *espumilla;* Port. *sendal;* Sp. *crespon*], a silk fabric of a gauzy texture, having a peculiar crisp or crimpy appearance. It is woven of hard-spun silk yarn "in the gum" or natural condition. There are two distinct varieties of the textile, — 1st, soft, Canton, or Oriental *C.*, and 2d, hard or crisped *C.* The wavy appearance of Canton *C.* results from the peculiar manner in which the weft is prepared, the yarn from two bobbins being twisted together in the reverse way. The fabric when woven is smooth and even, having no *crepé* appearance, but when the gum is subsequently extracted by boiling it at once becomes soft, and the weft, losing its twist, gives the fabric the waved structure which constitutes its distinguishing feature. Canton *C.* are used, either white or colored, for ladies' scarfs and shawls, bonnet trimmings, etc. The Chinese and Japanese excel in the manufacture of soft *C.* The crisp and elastic structure of hard *C.* is not produced either in the spinning or in the weaving, but is due to processes through which the gauze passes after it is woven. What the details of these processes are is known to only a few manufacturers, who so jealously guard their secret that, in some cases, the different stages in the manufacture are conducted in towns far removed from each other. Commercially they are distinguished as single, double, three-ply, and four-ply *C.*, according to the nature of the yarn used in their manufacture. They are almost exclusively dyed black and used in mourning dress, and among Roman Catholic communities for nuns' veils, etc. *C.* are chiefly imported from France. *Imp.* duty: for veils, 50 per cent; in piece silk, or for dresses, 60 per cent.

Crape-Morette, a white or colored gauzy woollen fabric of fine texture, the warp being light and open, and the weft relatively heavy and fleecy.

Crap-Leather, Crops, leather made from thin cowhides, used chiefly for pumps and light walking-shoes.

Crash, a heavy, narrow, low-priced linen fabric, used for towels, etc.

Crat, a Mocha weight of three grains.

Crate, a large wicker hamper with strong wooden supports, used for packing crockery-ware.

Cravat, a necktie or kerchief made of various materials.

Cray, a small sea vessel.

Cray-Fish, Craw-Fish, a long-tailed crustaceous animal (*Artacus fluviatilis*) of the lobster kind, found in fresh waters. It thrives best in rivers, and is commonly taken by nets or bundles of thorns in which flesh in a state of decomposition is placed.

Crayon, a material for drawing on paper, is of two kinds, — native and artificial. The former is generally of a black, white, or red color. The best black is a species of earth brought from Italy, of a bright even tint, and of a smooth and moderately hard texture. The best white is a kind of chalk, and is procured in France; it is of a brilliant color, but very brittle. Pipe-clay is sometimes employed as a substitute, though of an inferior tint. Red *C.* is a clayey ochreous kind of chalk. The artificial *C.* are composed of earths of different colors, and other pigments, rolled into

sticks with some tenacious substance, such as milk or beer-wort. *Imp.* duty, 30 per cent.

Manuf. Take pale shell-lac, 5 parts; wood naphtha, 12 parts; dissolve, and with this fluid mix up the coloring powder, previously stirred up with an equal weight of fine pale-blue clay; dry by a stove heat. When this process is well managed, it produces crayons equal to those of the best Parisian houses. — The composition may be formed into *C.* by simply rolling it on a slab; but to insure their solidity the manufacturers generally employ a metallic cylinder of 2 or 3 inches in diameter, with one end open and the other firmly secured to a perforated plate, having holes of the same size as the intended crayons. The *C.* composition, in the state of a stiff paste or dough, is introduced into the open end, and is forced down and through the holes, by means of a small plug or piston, that exactly fits the inside of the cylinder, and which is driven by the equable motion of a small screw. The pieces that pass through the holes are then cut into lengths and dried. The substances employed as coloring matters for *C.* are very numerous, and their choice offers a wide field for the skill and fancy of the artist. The pigment having been selected, it may be reduced to any shade or tint by admixture with other pigments, and by "dilution" with a proper quantity of elutriated or prepared chalk. As, however, *C.* colors do not admit of being mixed together at the time of using them, like liquid colors, it is usual to make 3 to 6 different shades of each color, so as to enable the artist at once to produce any effect he chooses.

Black C. From prepared black-lead, ivory-black, lamp-black, etc. Black chalk and charcoal are frequently made into *C.* by simply sawing them into suitably sized pieces. They may then be put into a pipkin of melted wax, and allowed to macerate for an hour; after which they should be taken out, drained, and laid on a piece of blotting-paper to dry. Drawings made with these *C.* are very permanent, and if warmed slightly on the wrong side, the lines will adhere, and become almost as durable as ink.

Blue C. From indigo, smalts, Prussian blue, verditer, etc.

Brown C. From umber (raw and burnt), terra di Sienna (raw and burnt), Cullen's earth, brown ochre, etc.; and some peculiar shades, from a mixture of black, carmine, and either of the above colors.

Green C. From a mixture of king's yellow, or yellow ochre, with blues.

Purple C. From any of the more brilliant blues, mixed with carmine, lake, or vermilion.

Red C. From carmine, carminated lakes, vermilion, hematite, and any of the earthy or mineral colors commonly used as pigments. *C.* of red chalk may be prepared in the manner pointed out for *C.* of black chalk.

White C. From pure clay and chalk.

Yellow C. From king's yellow, Naples yellow, orpiment, yellow ochre, etc.

Crayon-Board, thick drawing-paper or card-board for crayon drawings.

Crayon-Painting, Crayon-Drawing, the art or practice of drawing with crayons.

Craze-Mill, a crushing or grinding mill for tin ore.

Crazing, the cracking of the glaze upon articles of pottery or porcelain.

Cream, the oleaginous portion of milk, which collects in a thin stratum upon the surface, when that fluid is left undisturbed for some time. By violent agitation, as in the process of churning, the fatty globules unite together, forming butter; whilst the liquid portion, consisting of caseum, serum, and a little butter, constituting the residuum, is called buttermilk. This separation is effected the most readily when the *C.* has become partially sour and coagulated by being kept a few days, a change which occurs in consequence of the conversion of some of the sugar of the serum into lactic acid, which precipitates the caseous matter contained in the small portion of the milk with which the cream is mixed. On these simple facts chiefly depend the successful manufacture of butter. The *C.* intended for churning should therefore be kept until it turns slightly sour, and assumes the condition above referred to, as then the butter will readily "come." If churned while quite sweet the operation will be tedious, and will frequently fail. The addition of a little rennet or vinegar is the proper remedy in this case, and will cause the almost immediate separation of the butter. — When *C.* is suspended in a linen bag, and allowed to drain, it gradually becomes drier and harder, by the separation of the liquid portion, and then forms what is known by the name of *C. cheese*. By the application of slight pressure the separation of the whey is more completely effected, and the product is not only better, but will keep longer. — *C.*, in a dietetic point of view, may be regarded in the same light as butter, as it is converted into butter in the process of digestion. On this account much *C.* should never be taken at once by persons of delicate stomachs. In eating *C.* with fruit persons are hardly aware of the large quantity they consume, until they find it disagree with the stomach, when the condiment is blamed for the indiscretion of those who take it.

Cream-Slice, a wooden knife for parting cream.

Cream of Tartar. See POTASH.

Creance, a book debt in France.

Creancier, the French term for creditor; one to whom money is due.

Creaser, a tool used for making single or double lines on leather, to form guides or creases to sew by.

Creasote. See CREOSOTE.

Creaze, a mining term for tin, in the washing tub or buddle.

Credit, the term used to express the trust or confidence placed by one individual in another, when he assigns him money, or other property in loan, or without stipulating for its immediate payment. The party who lends is said to give *C.*, and the party who borrows to obtain *C.* In the earlier stages of society *C.* is in a great measure unknown This arises partly from the circumstance of very little capital being then accumulated, and partly from government not having the means to enforce that punctual attention to engagements so indispensable to the existence of confidence and *C.* But as society advances, capital is gradually accumulated, and the observance of contracts is enforced by authority. *C.* then begins to grow. The day on which it suits a merchant to purchase and send away a large quantity of goods may not be that on which he finds it convenient to pay for them. If it is made necessary for him to give ready money in return, he must always have in his hands a very large stock of money; and for the expense of keeping this fund (an expense consisting chiefly in the loss of interest) he must be repaid in the price of the commodities in which he deals. He avoids this charge, and also obtains time for preparing and adjusting his pecuniary concerns, by buying on *C.*; that is to say, by paying for his goods not by money, but by the delivery of a note, in which he promises the money on a future day. He is thus set more at liberty in his speculations; his judgment as to the propriety of buying or not buying, or of selling or not selling, and also as to the time of doing either, may be more freely exercised. But the custom of taking and of giving long credit has its inconveniences as well as its advantages. It increases the amount of the bad debts incurred in the course of commercial transactions. The apprehension of loss is therefore continually operating on the mind of the lender as a restraint on the custom of giving *C.*, while the compensation he receives for the use of the capital which he supplies acts as an encouragement to the practice. The subsisting state of *C.* may in general be considered as resulting out of a comparison made both by lenders and borrowers, of the advantages and disadvantages which each discover that they

derive from giving and taking *C.* Mercantile confidence, however, is not always dealt out in that proportion in which there is reasonable ground for it. At some periods it has risen to a most unwarrantable height, and has given occasion to the most extravagant and hurtful speculations. — Evils of this kind, however, have a tendency to correct themselves. In a country possessed of commercial knowledge and experience, confidence, in most instances, will not be misplaced. Some persons are of opinion, that when the custom of buying on *C.* is pushed very far, and a great quantity of individual dealings is in consequence carried on by persons having comparatively little property, the national commerce is to be considered as unsupported by a proper capital; and that a nation, under such circumstances, whatever may be its ostensible riches, exhibits the delusive appearance of wealth. It must, however, be remembered, that the practice of buying on *C.*, in the internal commerce of the country, supposes the habit of selling on *C.* also to subsist, and to prevail, on the whole, in an exactly equal degree. In respect to the foreign trade of a country, the practice of dealing on *C.* indicates poverty or riches, in proportion as the *C.* generally taken is longer or shorter than the credit given. *C.*, though of itself it can add nothing to capital, yet is thus often the invigorating influence that aids the processes by which it is fed. Capital might sometimes be frost-bound and stagnant, did not *C.*, as it were, lend the heat to thaw it, and set it flowing. Supposing all *C.* to be prohibited, every capitalist who may be incapable of employing his money successfully will either not invest it, or if he does, he will lose it; while those who have no capital, but are possessed of skill and capacity for its profitable management, are deprived of all opportunity of exercising the talent and activity with which they are endowed, — at least in the manner in which they might be most efficiently exercised. In both ways are inflicted private injury as well as public loss. But under a law permitting and protecting *C.*, the capital in the community is brought into combination with the skill of the community, and the result is the most productive application of both. These observations refer to the *C.* given to individuals engaged in business, who mean to employ the capital which they borrow in industrious undertakings, rather than to that which is given to individuals not so engaged, and who employ the advances made to them in supporting themselves and their families. That irregular description of *C.* which frequently takes place between the retailer and the consumer is decidedly a social evil. It is opposed to habits of frugality and prudence, and almost always leads to disaster both the trader and the borrower.

Crédit Foncier and **Crédit Mobilier** are finance institutions, which had their origin in the joint-stock speculation and sanguine promotion of public works which marked many years of the second empire in France, and to which the introduction of limited liability in England has given a great stimulus on the British side of the Channel. The parent institutions in Paris were followed by similar establishments in some other capitals. As the terms imply, the *C. F.* contemplates loans and advances on real securities, and the *C. M.* on personal or movable estate. Whether such limits and distinctions have been ever strictly observed in the practical working of these credit banks is doubtful. The *C. M.* of France has had a more unfortunate experience than the *C. F.*, though the latter has by no means sustained the promise of its early years. While the mania of launching new projects continued, enormous profits were made, which could only be the result of heavy promotion charges, and the shares rose in value with the extraordinary liberality of the dividends. But the system of business pursued had the result of mixing the credit banks very closely with the various companies and undertakings they were promoting, and of throwing back upon them a growing mass of depreciated or unsalable securities; while the abatement or collapse of speculation restricted the business from which the main part of the former income had been derived. The rules of dividend and the value of the shares consequently fell as rapidly as they had risen. This has been the practical experience of the *C. F.* and the *C. M.* of France, which were the first, and remain the greatest, examples of the finance companies so named. The *C. F.* of England (there has been no *C. M.* in London) has had much the same course as the French companies; large profits for a few years were followed by increasing difficulties, and the locking up of large amounts of capital in hopeless undertakings. "The title *Crédit Mobilier of America* was adopted by a joint-stock company organized in May, 1863, with a capital of $2,500,000. In January, 1867, the charter having been purchased by a company organized for the construction of the Union Pacific railroad, the stock was increased to $3,750,000, and afterward rose to a great value, paying enormous dividends. In 1872, in the course of legal proceedings in Pennsylvania respecting the ownership of stock, it appeared that several members of Congress, as well as the actual vice-president and one of the candidates for the vice-presidency, were more or less secret stockholders. This caused a great political scandal, as it was held to be highly improper for a member of Congress to be pecuniarily interested in a corporation whose profits might be so largely and directly affected by his vote on bills concerning the railway it was building. The fact that a presidential canvass was in progress, in which several of the persons implicated took an active part, added interest and excitement to the subject. The result was a congressional investigation in the session of 1872–73. On Feb. 27, 1873, the senate committee made a report, which closed with a resolution to expel one senator; but no action was taken on it, and five days later his term expired. In the House of Representatives resolutions censuring two members were passed." — *Cyclopædia Americana.*

Creditor, one to whom a sum of money or other thing is due; one who has a just claim for money or other obligation, — correlative to *debtor.*

Credit Union. See CO-OPERATION.

Creeper, a kind of small grapnel for dragging in search of anything lost in a harbor or river.

Creosote, Creasote, Kreosote, is the product of the distillation of wood-tar, more especially that made from beech-wood. *C.* is a highly refractive, colorless, oily liquid. It has a strong odor and hot taste, is non-conductive of electricity, and burns with a smoky flame. Sp. gr. 1.037. *C.* dissolves sulphur, phosphorus, resins, and many acids and coloring matters; and is soluble in alcohol, ether, and in 80 parts by volume of water. *C.*, like carbolic acid, is a powerful antiseptic, and readily coagulates albuminous matter; wood-smoke and pyroligneous acid, or wood-vinegar, owe to its presence their efficacy in preserving animal and vegetable substances from putrefaction. *C.* is given in medicine combined with acetic acid, sirup, spirit of juniper, and water. In small quantities it acts

as a sedative of the stomach, but in over-doses it is a violent poison, causing severe pain in the abdomen, nausea, headache, giddiness, and stupor. It is administered in cases of vomiting, diarrhœa, cholera, intestinal bleeding, and chronic gleet, and to assuage hunger and thirst in diabetes; in the form of a gargle it is of service in excessive salivation, and its vapor, mixed with that of water, is sometimes recommended for inhalation. Externally it is applied as a stimulant and styptic, and for the treatment of decayed teeth; and an ointment containing it is used as a remedy for ringworm. *C.* is also employed for preserving timber from dry-rot, and for the curing of fish and hams. It is largely manufactured in and exported from this country. *Imp.* duty, 40 per cent.

Crepon, a thin stuff made of wool, silk, or mixed, resembling crape.

Crequillas, a textile cotton fabric of light and low-priced quality.

Cress, the general name of a number of plants possessing pungent and aromatic qualities. The garden *C.*, *Lepidium sativum*, is a hardy and esteemed salad plant.

Crete, or **Candia**, one of the largest islands in the Mediterranean, belonging to Turkey. It is situated to the S. of the Grecian Archipelago, between 34° 50′ and 35° 40′ N. lat., 23° 30′ and 26° 20′ E. lon. Length 160 m.; breadth varying from 10 to 35 m. By far the greater part of the surface of the island is occupied by ranges of mountains, some of which attain to a very considerable height. The coasts of *C.* present a very broken and varied outline. In the W. especially they form a number of rugged and lofty promontories, among which must be quoted the peninsula of Akrotiri, bounding the bay of Sudha, which constitutes a naturally sheltered harbor of sufficient size to afford protection to the fleets of all Europe. The Greek language is the only one spoken throughout the island. Pop. 200,000. The soil of *C.* is fertile, producing corn, especially barley, oil, honey, and wine, besides considerable quantities of cheese, wool, wax, silk, valonia, carobs, and a variety of fruits. The principal exports are white soap, sent chiefly to Turkey and Greece, oil, silk, raisins, carobs, valonia, almonds, chestnuts, oranges, lemons, and linseed; and the imports, grain, rice, cottons and piece-goods, timber, leather and hides, tobacco, sugar, barilla, butter, salt-fish, etc. The chief commercial intercourse is with Turkey, Greece, Austria, and Egypt. The principal ports are: —

Candia, the former cap. and still the most populous city of *C.*, on the N. shore, lat. 35° 20′ N., lon. 25° 9′ E. The harbor, which had grown almost inaccessible, has been deepened. It is formed for the most part by the ancient moles, and was never deep enough to admit the large vessels even of the Venetians, which were accustomed to anchor in the port of the neighboring island of Standia. Pop. 16,000.

Canea, or Khania, the cap. of the island and its principal seaport, on the N. coast, finely situated on the isthmus of the Akrotiri peninsula, which lies between the Bay of Canea and the Bay of Sudha; lat. 35° 31′ N., lon. 24° 1′ E. The harbor, formed by an ancient transverse mole nearly 1,200 feet long, would admit vessels of considerable tonnage; but it has been allowed to silt up until it shoals up from 24 feet to 10 or even 8 feet, so that large vessels have to anchor about 4 or 5 miles out. Pop. about 12,000.

Crevet, a crucible or melting-pot.

Crew, the company of sailors belonging to any ship or vessel. The duties and rights of seamen are explained under the articles Master and Seaman in this work. Ready obedience to the lawful orders of their superiors, ability to discharge their duties, and alacrity in their performance, at all times and under the most perilous circumstances, are the distinguished characteristics of good seamen.

Crewel, worsted twisted in knots, and sold for tapestry and embroidery work; now called Berlin wool.

Crib, a child's bed or cot, of iron, cane, or wood. — The rack or manger of a stable. — A reel for winding yarn in Scotland. — A small raft of timber in Canada. A crib of white pine generally contains 1,500 cubic feet; of red pine, 1,000 cubic feet.

Cribbage-Board, a marking-board with holes, on which players score the game of cribbage with pegs.

Cribble, a sieve.

Crick, a small jack-screw.

Cricket, a game played with a bat and ball, and stumps or wickets.

Crimper, in boot and shoe making, a curved board over which the *upper* is stretched, to give it the required form. There are several patented machines for expediting the process of crimping.

Crimping-Iron, an instrument for crimping and curling the hair; a curling-tongs.

Crimping-Machine, an apparatus for crimping the ruffles of a shirt, women's cap-borders, etc.

Crimson, a deep red color; a red tinged with blue; also, a red color in general.

Crin, the French name for horsehair.

Cringle, a nautical term for a ring or thimble fitted or spliced into the bolt-rope of a sail.

Crinoline, a distended petticoat; a hoop, made of various materials, such as hair-cloth, cane, whalebone, steel wire, etc., by which women's dresses are expanded. These articles of toilet, which for 25 years were the object of a considerable trade, are now entirely out of fashion.

Crisper, an instrument for crisping the nap of cloth.

Cristal [Fr.], cut glass.

Crochet, a species of knitting, performed by means of a small hook; the materials being fancy worsted, Berlin wool, cotton, or silk.

Crochet-Lace, hand-knitted lace, remarkable for cheapness, durability, delicacy, and elegance of design; qualities which have caused it to take the place, to a considerable extent, of the Honiton, Valenciennes, and Brussels laces.

Crochet-Needle, a lady's bone or metal knitting-hook for working crochet. *Imp.* duty, same as knitting-needles. See Needle.

Crockery-Ware, a common name for the ordinary classes of cheap earthenware. See Pottery.

Crocus. See Colcothar.

Crook, a shepherd's hook. — Any bent-headed instrument.

Croom, a husbandman's fork with long prongs.

Crop, that which is cut off, plucked off, or gathered during the season; the yield of the fields; the harvest. — A miner's term for the best ore. — The commercial name for one side of sole-leather, with belly and shoulders cut off, and a rounded crop for an entire hide. — A fixed weight in different localities for sugar, tobacco, and other staples.

Crop-Hogshead, the usual recognized weight of a crop-hogshead of tobacco is from 1,000 to 1,300 lbs. net.

Cropping-out, in mining an exposure of the seam, or lode, to the surface.

Crore, in Hindoo enumeration, signifies ten millions. It is used to express 100 lacs of rupees; and as each lac is 100,000 rupees, or nearly $50,000, the *C.* is about $5,000,000.

Cross-Cut, in mining, a lode level, driven at right angles to the direction of the vein.

Cross-cut Saw. See SAW.

Crossed-Check. See CHECK.

Crossing, a casting placed at the rectangular intersection of two railroads, when the rails of each track are partly cut away to allow passage to the flanges of the crossing wheels.

Cross-Piece, a part of anything which is worked or fitted crosswise.

Cross-Sill, a railroad sleeper or tie lying transversely beneath the rails.

Cross-Somer, a beam of timber.

Cross-Springer, in groined vaulting, the rib which extends from one pier to another.

Cross-Staff, a surveyor's instrument for measuring offsets.

Cross-Tie, a railway sleeper. — A connecting band in building.

Cross-Trees, pieces of wood at the mast-head of a vessel.

Crotalo, a Turkish musical instrument.

Crotches, forked pieces of mahogany or other timber; not straight logs.

Croton Oil, the seeds of the *Croton tiglium*, a small tree growing in Hindostan, Ceylon, and the Moluccas. The whole plant contains an acrid, purgative principle. The seeds have been known in Europe, from the beginning of the 17th century, under the name of *grana Molucca* and *grana tiglia*. Unlike most other fixed oils, croton oil is soluble in alcohol. It is slightly viscid; color brownish yellow, taste acrid, odor faintly nauseous. It is the most powerful purgative known, and also a powerful local irritant and rubefacient. Rubbed on the skin, it produces a pustular eruption, and frequently purges. *Imp.* duty: bark, free; oil, $1 per lb.

Crottles, a Scottish name for certain mosses and lichens used in the Highlands for dyeing woollen stuffs brown, etc.; *Parmelia physodes* is the dark brown *C.*; *Sticta pulmonacea*, the light brown *C.*; *Isidium corallinum*, the white *C.*, used in the preparation of a red or crimson dye; *Parmelia omphalodes* is the black *C.*; and *P. saxatilis* is one of the *C.* most frequently used in dyeing yarn.

Crowbar, a wrought-iron lever for prizing or lifting.

Crow-Berry, a name given to the fruit of the bilberry, *Vaccinium myrtillus*.

Crown, a kind of paper 15 inches by 20. — An English current silver coin weighing 18 dwt. 4.36 grains, worth 5s. or about $1.21. Of this silver piece very few have been coined lately; the only issue from the mint in the last years was 466 crowns in 1851. The half-crown is also giving place to the florin, shilling, and smaller silver coins.

Crown-Glass. See GLASS.

Crown-Saw. See SAW.

Crown-Wheel. See FACE-WHEEL.

Crow-Quills, feathers of the crow which are used for pens, where very fine writing is required, as in lithography and tracing, etc.

Crow's-Nest, a lookout house at the main top-gallant mast-head in arctic vessels, consisting of a cask or other screen or shelter for a man.

Croze, a cooper's tool, resembling a *gauge*, but much larger. It is used for marking the grooves for the heads of casks.

Crozing-Machine, a machine used by coopers for cutting on staves the croze, or groove for the reception of the edge of the head.

Crucible, a vessel used by metallurgists and chemists for holding substances whilst they are exposed to a high temperature. The *C.* commonly used for fusing metals are formed of clay, or a mixture of plumbago and clay. For certain purposes, crucibles of platinum, gold, silver, iron, porcelain, and lime are employed. *Imp.* duty: black lead, 20 per cent; sand, 25 per cent.

Earthen C. are made from fire-clay, mixed with silica, coke, burnt clay, or other infusible matter. The materials, having been ground and kneaded, are generally moulded by hand upon a wooden block of the shape of the cavity of the *C.* Another method of shaping a *C.* consists in ramming the ingredients into a suitable mould, formed of steel or gun-metal. Small *C.* are sometimes formed by pouring "slip," that is, clay mixed with sufficient water to give it the consistence of cream, into porous moulds, made of a species of stucco. A series of these moulds are placed upon a table and filled with the semifluid composition. By the time the whole (say 50 or 60) are filled, the "slip" may be poured out of the one first filled, leaving only a very small quantity behind to give the requisite thickness to the bottom. The second and third may then be treated in the same way, until the whole number have been attended to. In each mould a perfect *C.* is formed, by the abstraction of the water of that portion of the "slip" in immediate contact with the stucco, and the *C.* is either thicker or thinner in proportion to the time this absorbent action has been allowed to go on. 70 or 80 *C.* may thus be easily made in less than 15 minutes. The moulds and their contents are next placed in a stove or slow oven. In a short time, from the contraction of the clay in drying, the *C.* may be removed, and the moulds, as soon as they have become dry, may be again filled; by care they will last for years. Earthen *C.* are used both in the burnt and unburnt state.

Graphite or *Plumbago C.* are made from graphite, ground and sifted, mixed with sufficient refractory clay to render it plastic. They are shaped by hands on an ordinary potter's wheel, or by moulds of metal. Good black lead *C.*, even when of the largest size, support the greatest and most sudden alternations of temperature without cracking, and may be used after repeated heating and cooling. Their surface, within as well as without, may be made very smooth, so that particles of melted metal will not hang about the sides. They are now almost universally used for melting the precious metals, and are extensively manufactured in this country, in Jersey City, N. J., by the Dixon Crucible Co., and in other places.

Gold C. are exceedingly useful for many operations, on account of the way which they stand caustic and carbonated alkalies, and nitric acid, which destroy platinum or silver *C.* respectively. Their drawbacks are their great expense and ready fusibility.

Iron C. are used chiefly for preparing common reagents, as sulphide of iron, etc., and also for preparing pure caustic potassa from the nitrate.

Platinum C. These are indispensable instruments in the laboratory of the analytical chemist. They are chiefly employed in the ignition of precipitates, and in the fusion of silicates with carbonated alkalies to render them soluble, a preliminary step to their analysis. The most ordinary form of the platinum *C.* is that of a cup with a flat bottom. They are always provided with lids, which are sometimes so constructed that they may be used, when separated from the *C.*, as capsules for ignitions and evaporations. Platinum *C.* are not acted on by carbonated alkalies at a high temperature, but they are liable to be seriously damaged by the caustic alkalies. Precipitates of the more reducible metals must never be ignited in these *C.*, as the reduction of the metals would infallibly destroy the vessels.

Porcelain C. These beautiful vessels are made in Germany and France of all shapes and sizes. They are formed of the most exquisitely white, thin, and hard porcelain, which does not crack when heated, and which is but little acted on by the most energetic chemical reagents. For some operations they supersede platinum *C.*, particularly in the ignition of the precipitates of the more reducible metals. They do not retain coloring matter, and are not porous. Their covers are excellently adapted for delicate cases of testing, the whiteness of the porcelain showing the changes of color in a single drop of liquid most distinctly.

Silver C. are much used for fusions of alkalies, being much less acted on than platinum *C.*; and also for water analyses, from their cheapness and light weight. They are easily destroyed, however, by acids.

Crude, raw; in a primary state; not manufactured.

Cruet, a vial or small glass bottle for holding condiments for the table; a caster. A *cruet-stand* is a frame for holding several cruets.

Cruise, to rove on the sea without any certain course, in search of an enemy's ship for capture, or for protecting commerce.

Crumb-Brush, a curve-shaped brush with short handle for sweeping the crumbs from a table-cloth.

Crumb-Cloth, a linen or holland carpet-cover for a living-room.

Crupper, a leather strap for the saddle to the horse's tail.

Crusado, Cruzada, a Portuguese gold coin; the old *C.* being worth 400 reis, and the new 480 = about 50 cents. There are, however, silver crusadoes of 240, 120, and 60 reis.

Cruset, a goldsmith's crucible.

Crushing, in mining, the process of pulverizing or grinding the ores without water.

Crushing-Mill, a mill of various kinds for crushing ore, stone (Fig. 44), malt, or other substance.

Crutch, wooden support made to assist lame persons or cripples in walking. — A knee, or piece of knee-timber, placed inside a vessel to secure the heels of the cant-timbers abaft.

Cruth, a Welsh musical instrument with six strings, played upon with a bow.

Cryolite, a massive, granular, cleavable, translucent, brittle mineral, of a snow-white (sometimes reddish or brownish) color, vitreous lustre; sp. gr. 2.9 to 3.7. Its transparency is increased by immersion in water. It is a double fluoride of aluminium and sodium, found only in Greenland. *C.* is used in the manufacture of soap, soda, aluminium sulphate, alum, and cryolite glass. *Imp.* free.

Crystal, the common name for quartz, or pure crystalline silex; also for a superior description of glass. In chemistry, however, a *C.* is any inorganic solid, bounded by plane surfaces symmetrically arranged, and produced by the operation of chemical affinity in the transition from the fluid to the solid state. See CRYSTALLIZATION.

Crystalene, a kind of mineral oil, newly introduced in the trade, and whose composition is kept a secret. It has neither taste nor smell, and is not affected by water, oils, acids, alkalies, or heat. This seemingly wonderful product is capable of almost universal use, as a paint, a varnish, an enamel, etc., or it can be made into plastic form, in which latter state it can be made into ornaments, and many useful articles, being easily moulded into any shape. As a paint for outside or inside work, it gives a surface superior to anything in the market, hard, firm, smooth. As a varnish and enamel, it produces a very superior surface. Frescoed walls made with it can be washed the same as a plain wood-work; and a keg coated with it has held kerosene oil for months, and the shelf on which it stood had not a mark of oil on it. *C.* can be applied to wood, iron, tin, etc., leather, paper, cloth, silk, etc. It does not crack or peel off under any ordinary use, and seems capable of standing the severest tests. Applied to leather, a fine enamelled surface is produced, which will not crack, even under the greatest pressure, until the texture of the leather has been destroyed; and while producing a hard, flint-like surface, it leaves to leather its flexibility.

Crystallization, the act or process by which crystals are formed. The frequent reference to this subject in the pages of this work, and the constant employment of the process of *C.* in the manufacture of salts, etc., in the laboratory, seem to point out the necessity of a few explanatory remarks thereon under this head. When fluid substances are suffered to pass with adequate slowness to the solid state, or when solutions of solids are slowly concentrated by evaporation, or the solvent powers of the menstruum, gradually lessened by cooling, the ultimate particles of matter so arrange themselves as to form regular geometrical bodies, familiarly known by the name of crystals. This wonderful property, which is possessed by a great variety of substances in the mineral kingdom, and by nearly all saline bodies, is resorted to for many useful and important purposes in the chemical arts. It is by means of *C.* that the majority of salts are obtained in a state of purity; for in the act of passing into the crystalline state, the foreign substances with which they are united are left behind in the mother-liquor.

Salts are crystallized, either by allowing their hot and saturated solutions to cool slowly, or by simply evaporating the menstrua as long as crystals form. In the first case, the liquid is commonly evaporated until a pellicle appears on the surface, when the vessel is set aside in some sheltered situation until cold, at which time the crystals are collected, and the process repeated for fresh crystals. In the second case, the crystals are usually removed from the liquid as soon as they are deposited. The first method is adopted for those salts that are considerably more soluble in hot than in cold water, as carbonate of soda, Epsom salts, etc.; the last method, for those that possess nearly equal solubility in both cases, and also for many salts which are not required in handsome crystals; thus common salt and chromate of potash are crystallized in this way. Many of the alkaloids, and their salts, are obtained in crystals, by allowing their solutions (generally alcoholic or ethereal) to evaporate spontaneously. By repeating the processes of solution and *C* two or three times with the same body, the crystals obtained by the last operation will usually be found to be quite pure. Many solids may be readily obtained in a crystalline state by melting them and allowing them to cool very slowly. Thus, iodide of sulphur is crystallized by melting it in a flask placed in a salt-water bath, and allowing it to remain in the water until the whole becomes cold. Sulphur and many metals are crystallized by pouring them, in a state of fusion, into a hot vessel having a plug in the bottom, which is withdrawn as soon as the surface becomes cool, when the liquid portion runs out, and leaves the under surface in the form of a mass of agglomerated crystals. Perfectly pure wax, stearine, and spermaceti have a very pleasing appearance when treated in this way.

Crystallo-Type, a photographic picture on glass.

Cuartane, the twelfth part of the cuartera; a Spanish weight.

Cuartas, Cuartel, the most valueless kind of tobacco in Cuba, fit only for filling cigars.

Cuartella, a variable dry measure in Spain, ranging from 0.077 to 0.388 bushel. As a liquid measure for wine, it is generally equal to 1.065 gallon, and for oil 0.829 gallon; 4 *C.* make an azumbre. The Arragonese *C.* as a weight is 0.016 lb.

Cuartera, a Spanish corn measure; 2½ *C.* make one carga. 100 *C.* of Barcelona = 24⅞ quarters.

Cuarteron, an oil measure of Madrid = 0.033 gallon.

Cuba, the largest and richest of the West India Islands, and the most important colony of Spain. The island of *C.* is long and narrow, somewhat in the form of an irregular crescent, with its convex side towards the north. It divides the entrance to the Gulf of Mexico to the N. W., being 130 m. wide at the narrowest part, between the points of Yeacos in *C.* and Sable on the Florida coast, and the S.W. passage of nearly the same width, between the Cabo de San Antonio of *C.*, and the Cabo de Catoche, the most salient extremity of the peninsula of Yucatan. On the N. E., E., and S. E., narrow channels separate it from the Bahamas, Hayti, and Jamaica. *C.* lies between lon. 74° and 85° W., lat. 19° and 23° N. Its length, following a curved line through its centre, is 730 m.; average breadth 80 m. Its area is 43,319 sq. m.; the neighboring *island of Pinos*, 1,214 sq. m.; and the smaller coast islands, 1,350 sq. m.; in all, 45,883

sq. m. *C.* is ruled over directly by a governor-captain-general of the class of lieutenant-general of the Spanish army, whose authority for the time being is despotic. He is appointed by the Crown, the term of office being generally from 3 to 5 years, is responsible only to the sovereign of Spain, and is supreme head of the civil, military, and ecclesiastical jurisdictions of *C.* The captain-general is assisted by governors of departments, who have under their orders the lieutenant-governors, commanders of the 32 jurisdictions of the islands, each of which is subdivided into *partidos*, or captaincies. In each city or town a municipal body termed the *ayuntamento*, or town council, is at the head of affairs, but municipal representation exists only in appearance. The military division is into two departments, — that of the W., with Havana for its capital, and that of the E., with Santiago de Cuba for its headquarters. The *Real Audiencia*, holding session at Havana, is a species of council of state which the captain-general consults on all difficult matters of administration. The maritime division is subject to a commander-general, and consists of 5 stations or provinces, with their centres at Havana, Trinidad, San Juan de los Remedios, Nuevitas, and Santiago de Cuba. In popular language, the different portions of the island are distinguished as the *Vuelta Abajo*, or the portion extending from the meridian of Havana to the W. extremity of the island; the *Vuelta Arriba*, from the meridian of Havana toward the E. as far as Cienfuegos; *Las Cinco Villas* from the meridian of Cienfuegos to that of Santo Espiritu; and *Tierra Adentro* from that of Santa Espiritu to Holguin and the extreme E. of the island. The inhabitants of *C.* are divided into 4 classes, — the native Spaniards, who occupy nearly all the offices of power and trust; the creoles, who are mostly planters, farmers, or lawyers, and are generally looked upon with contempt by the Spaniards; the third class, composed of free mulattoes and free negroes in about equal parts, who are excluded by law from all civil offices, — those under servitude, constituting the fourth class, divided into the *bozales*, those recently brought from Africa, the *ladinos*, those imported before the law of 1821 prohibiting the slave-trade, and the *criollos*, those born on the island. *C.* was long notorious for the extent to which the slave-trade was carried on there, and the ineffectual efforts made to suppress it. The importation of African slaves has, however, ceased for a number of years. In their place Asiatic *coolies* were introduced in considerable numbers, and treated as slaves in almost every sense; but in June, 1879, by treaty between Spain and China, the immigration of Chinamen by contract was entirely prohibited, and Spain has engaged to treat the Chinese in *C.* with the same consideration as foreigners of the most favored nation. — Under a better and more liberal system of government, there can be no doubt that *C.* would speedily attain a much higher state of prosperity and importance than it has yet enjoyed. Great as is its productiveness at present, some writers assert that under good government it would be increased fivefold; its mineral resources would then be fully developed, and it would be able fully to take advantage of its admirable position to develop its trade. Owing to the disturbed condition of the island, no census of the inhabitants has been taken since that of 1861. The results of the enumeration of that year made the total pop. 1,396,530, distributed thus: —

Fig. 115. — Havana.

Naturalized whites	730,994
Asiatic coolies	34,834
Mexicans (Yucatese)	1 047
	766,775
Free colored	232,493
Slaves	370,553
	603,046
Resident foreigners	5,298
Passing "	3 987
Spaniards	17,424
	26,709

An official statement, made in 1872, gives a total of 1,359,437 (including 50,000 coolies), or 1,034,616 in the W. division, of which Havana (pop. 230,000) is the chief city; 75,725 in the central districts round Puerto Principe (pop. 31,000); and 249,096 in the E. division, the chief town of which is Santiago de Cuba (pop. 37,000). The only other town of importance is Matanzas, with a pop. of 36,000.

Numerous lines of steamers run between Havana and New York, New Orleans, Key West, Philadelphia, and Baltimore; and with Europe, communication is maintained by English mail as well as French and German lines of Ocean steamers. The island is connected by telegraph with the U. States.

The coast of *C.* is generally low and flat, and is surrounded by numerous islands and reefs, which render the approach both difficult and dangerous to those not acquainted with the proper channels. The low nature of the shore subjects it to frequent floods and inundations; and especially on the N. side there are many large lagoons, from which a considerable quantity of salt is obtained. No island, however, in proportion to its size, has a greater number of excellent harbors, many of them accessible even to ships of the line. Of these, the chief are the ports of Bahia Honda, Mariel, Havana, Matanzas, Cardenas, Nuevitas, and Nipe on the N. side, and Guantanamo, Santiago de Cuba, Trinidad, and Cienfuegos on Xagua Bay on the S. The highest part of the island is in the range of mountains extending in the S.E. from the Punta de Maysi to Cape Cruz, called the Sierra or Montaños de Maestra, or Cobre, the summits of which are the Pico de Tarquino, 7,670 feet, the highest point of the whole island; Gran Piedra, 5,200 feet; Yunque and Ojo del Toro, 3,500 feet. From this Sierra, a ridge of much smaller general elevation follows nearly the central line of the island westward throughout its extent, rising to form a more marked range in the extreme W. of *C.*, on which the Pan de Guajaibon attains 2,530 feet. An almost isolated mass, of which the Pico de Potrerillo is the summit, 2,900 feet above the sea, rises immediately behind the harbor of Trinidad, near the centre of the S. coastland. The S.E. sierra is one great calcareous mass, resting on a schistose formation. The summits are for the most part rocky and naked, occasionally interrupted by more gentle undulations. The central and western parts of the island contain two formations of compact limestone, one of clayey sandstone, and another of gypsum. Caverns abound in the limestone formations. — *Climate.* Situated within and near the border of the N. tropical zone, the climate of the low coastlands of *C.* is that of the torrid zone, but the higher interior of the island enjoys a more temperate atmosphere. As in other lands on the border of the tropics, the year is divided between a hotter and wetter season, corresponding to the northern declination of the sun, and a cooler and drier period. The months from the beginning of May to Oct. are called the wet season, though rain falls in every month of the year. With May, spring begins in the island, rain and thunder are of almost daily occurrence, and the temperature rises high, with little daily variation. The period from Nov. to April is called the dry season by contrast. On a mean of 7 years, the rainfall at Havana in the wet season has been observed to be 27.8 inches, of the dry months 12.7, or 40.5 inches for the year. At Havana, in the warmest months, those of July and August, the average temperature is 82° F., fluctuating between a maximum of 88° and a minimum of 76°; in the cooler months of Dec. and Jan., the thermometer averages 72°, the maximum being 78°, the minimum 58°; the average temperature of the year at Havana, on a mean of 7 years, is 77°. But in the interior, at elevations of over 300 feet above the sea, the thermometer occasionally falls to the freezing point in winter, hoar-frost is not uncommon, and during N. winds thin ice may form, though snow is unknown in any part of the island. The prevailing wind is the easterly trade breeze, but from Nov. to Feb. cool N. winds (*los nortes*, or "northers"), rarely lasting more than 48 hours, are experienced in the W. portion of the island, to which they add a third seasonal change. From 10 to 12 o'clock are the hottest hours of the day; after noon a refreshing breeze (*la virazon*) sets in from the sea. Hurricanes may occur from August to Oct., but are less frequent than in Jamaica or Hayti, and sometimes 5 or 6 years may pass without such a storm. Slight shocks of earthquake are occasionally felt. There are no diseases specially indigenous to the island; the yellow fever, which breaks out with renewed virulence regularly with the wet season in the coastlands and seaports of *C.*, annually causing great loss of life, is quite unknown in the interior. — *Minerals.* The mineral riches of *C.* have not yet been explored to any considerable extent. Though gold and silver have undoubtedly been found in the island, the quantity has never been sufficient to repay the labor of search. The Cobre copper-mines, 12 m. from Santiago, are of great extent, and very rich. As much as 50 tons of ore are taken out daily, the richest part of which, being broken up, is shipped to Europe, while the poorer part is smelted at the works, yielding about 14 per cent of metal. Coal of a highly bituminous character, affording a stong heat, and leaving very little solid residue in the form of ashes or cinders, is very abundant. In some places it degenerates into a form resembling asphaltum, and near the coast it is often found in a semi-liquid state like petroleum or asphalta. In the quarries near Havana a thick slate is found, fit for floors and pavements. Marbles and jaspers of various colors, and susceptible of a high polish, are found in many parts of the island, and particularly in the Isle of Pines. It is generally believed that iron exists in various districts; but from the difficulty of access, the scarcity of fuel, and the want of capital, no extensive mining operations have been engaged in. Native loadstone, however, has been found in various parts, and

Fig. 116. — Bamboos

chalybeate springs are numerous. — *Vegetable products.* The forests are of vast extent, and so dense as to be almost impenetrable. It is estimated that of nearly 20,000,000 acres of land still remaining perfectly wild and uncultivated, nearly 13,000,000 are uncleared forest. Mahogany and other hard woods, such as the Cuban ebony, cedar, sabicel, and granadilla, valuable for manufactures, cabinet-work, and ship-building, are indigenous, and are exported to a considerable extent. The palm is the queen of the Cuban forests, and the most valuable tree. The most common species, the *Palma real* (*Oreodoxa regia*), is found in all parts, but especially in the W. The tree-like bamboo (Fig. 116), rising to a height of 60 and even 80 feet, is found in several parts of the island. The fruits of *C.* are those common to the tropics, of which the pineapple and orange are the most esteemed. Of the alimentary plants, the plantain is by far the most important. Next in order

come the sweet and bitter cassava, — the sweet root being eaten as a vegetable, and the bitter converted into bread after its poisonous juice has been extracted. The sweet potato and other farinaceous roots are also common. Indian corn is indigenous, and rice is extensively cultivated; cocoa or chocolate is also grown. The chief agricultural products of *C.* are, however, sugar, coffee, and tobacco. The *ingenios* or sugar estates, with large buildings and mills for sugar-refining and distillation of rum, are the most important industrial establishments of the island, varying in extent from 500 to as much as 10,000 acres. Of late years, partly from the effects of the insurrection, and partly from the rapidly extending cultivation of beet-root sugar in other countries, the demand for Cuban sugar has been diminishing, and the sugar estates have not flourished. The U. States take about 70 or 80 per cent of the sugar grown in *C.*, the greater part of the remainder passing to Europe. The quantity exported in 1873 from the ports of Havana, Matanzas, Cardenas, Sagua la Grande, Remedios, Nuevitas, Santiago de Cuba, Trinidad, and Cienfuegos exceeded 700,000 tons, of a value of about $70,000,000. Besides this, 286,000 tons of molasses were exported. After the "ingenios" the *cafetales*, or coffee estates, are the most important establishments. They vary in extent from 100 to upwards of 1,000 acres, or even more in the mountain districts, — the number of hands employed being as high as 100 in the low country, but generally averaging 50 or 60 negroes to 1,000 acres. The first coffee plantation was established in 1748, the seeds having been brought from San Domingo. Though at one time coffee was sent out from Cuba in enormous quantities, it does not now figure largely in the exports. Tobacco is indigenous to Cuba, and its excellent quality is celebrated in all parts of the world The estates devoted to its cultivation are scattered over the greater part of the island, but the finest qualities of tabacco are those grown in the country west of Havana, known as the "vuelta abajo." In 1878, 196,850,000 cigars were exported, besides about 14,500,000 lbs. of leaf, to the U. States, Great Britain, Hamburg and Bremen, Holland, France, and Spain. Among the other industrial establishments of *C.* may be mentioned the numerous cattle farms, cotton plantations, fruit and vegetable farms, chocolate plantations, and *colmenares*, or farms devoted to the production of honey and wax.

The imports consist mainly of jerked beef from S. America, codfish from Canada and New England, flour from Spain, rice from the Carolinas, Spain, and the East Indies, wine and olive oil from Spain, coals from Europe and N. America, and petroleum from the U. States, besides large quantities of American, British, German, and Belgian manufactures and hardwares. Heavy differential duties in favor of goods imported into *C.* in Spanish ships are in force, so that the greater part of the imports arrive in these. Cattle are imported from Florida and the coasts of the Mexican Gulf. There are no manufacturing industries of importance in the island. Under the continual apprehension of the insurrection, which lasted from 1868 to 1878, *C.* has seen her trade decrease, her crops reduced, and her taxes have been trebled in vain to meet the ever-increasing expenses and floating debts. In 1879, a commission was created by the governor-general to study, form, and submit to the consideration of the Spanish government, the basis of a commercial treaty with the U. States and Canada.

The following is a table of the General Commerce of *C.* with the U. States for the 20 years ending with 1878: —

Year.	Imports from the U. States.	Exports to the U. States.	Total imports and exports.
1859	12,268,202	34,054,424	46,322,626
1860	12,382,869	34,032,276	46,415.145
1861	12,892,077	33,536,357	46,428,434
1862	11,048,710	20.931,983	31,980,693
1863	15,053,293	21,534,065	36,587,358
1864	17,459,165	33,476,599	50,935,764
1865	20,083,812	30,606,796	50,690,608
1866	15,772.160	37,795,812	53,567,972
1867	15,818,075	39,324,765	55,142,840
1868	18,648,428	50,750,727	69,399,155
1869	19,708,742	58,201.374	77,910,116
1870	17,412,781	54,056,415	71,469.196
1871	15,840,202	58.240,584	74,080,786
1872	14.751,956	67,720,205	82,472,161
1873	16,628,768	77,469.826	94,098,594
1874	21,591,509	86,272,466	107,863,975
1875	21,961,009	66,745,527	88.706,536
1876	16,049,932	58,717,688	74,767,620
1877	16.670,424	67.699,299	84,369.723
1878	13,162,382	58,885,162	72,047,544
Total	325,204,496	990,052,350	1,315,256.846

The value of the principal articles *imported* from the U States in 1878 was: Acids, $15,434; agricultural implements, $26,609; horses, $34,470; mules, $141,510; manuf. of brass, $23,089; crackers, $39,837; Indian corn, $168,782; oats, $21.370; wheat flour, $150,261; other small grain and pulse, $349,267; brooms and brushes, $13,399; carriages, $23,360; railroad cars, $54,684; bituminous coal, $212,740; other coal, $64,964; cordage, rope, and twine, $94.600; manuf. of cotton, $74,940; drugs and chemicals, $127,741; fruits (green and preserved), $47,165; glass and glassware, $55,854; hay, $43,397; manuf. of hemp, $67,328; ice, $45,182; iron manufactures, $1,458,400; edge tools, $28,983; manuf. of marble, $62,252; mineral oil, $391,653; paper and stationery, $162,842; perfumery, $43,295; bacon and ham, $938.492; butter, $56,111; fish (fresh, cured, dried, or smoked), $279,973; lard, $1,850.211; preserved meats, $33,867; pork. $26,750; onions, $16,735; potatoes, $408,476; scales, $15,057; sewing-machines, $66.631; tallow, $25,965; manuf. of tobacco, $38,271; trunks, $35,423; wood (boards, shooks, staves, hogsheads, etc.), $1,927,591; household furniture, $79,627.

The value of the principal articles exported to the U. States during the same year was: — Foreign coin, $1,791,037; American coin, $160,719; brown sugar, $44,702,311, molasses, $4,265,196; melada and sirup of sugar-cane, $1,119,975; tobacco leaf (7,767,955 lbs.), $4,020,981; cigars (604,864 lbs.), $2,239,455.

Communication. The roads of *C.* are generally in a very wretched condition. Several railroads have been established. The oldest, opened in 1838, extends from Havana to Guines, a distance of 45 m., and has branches to Batabano, San Antonio, and Los Palos. There are lines in operation from Matanzas to Sabanilla, Cardenas to Bamba and Jucaro, and thence to unite with the line which crosses the island between Sagua la Grande and Cienfuegos, as well as from Puerto Principe to Nuevitas. The whole length of lines in operation is nearly 400 m. Coastal communication is kept up by steamers which ply regularly between the different ports.

Finances. The crown revenues of the island are the *rentas maritimas*, including duties on imports, exports, and tonnage, and the local or municipal duties levied at some of the customhouses; the *impuestas interiores*, including the tax on home manufactures, the sale of stamped paper, the profits derived from the lottery, and the impost on cock-fights; deductions from the *rentas ecclesiasticas*, particularly those called the royal ninths and the consolidated fund, the sinking fund, the *media annata*, and the annual and monthly revenues of the clergy; personal deductions, such as from the pay of public functionaries and the price of exemption from military service; miscellaneous receipts, as the produce of the sale of royal lands, the rents of vacant livings and of unclaimed estates, the produce of vendible offices; and casual receipts, including deposits, confiscations, donations, and the recovery of arrears. Previous to the outbreak of the insurrection of 1868, the total revenue of *C.* had reached nearly to $26,000,000, of which sum about $6,000,000 was annually remitted to Spain, leaving the remainder to cover the expenses of the army, navy, and civil service of the island. Since 1868 the imposts have been much increased, but have not been sufficient to cover the enormous increase of expenditure consequent on the rebellion. The government of the island has thus been compelled to borrow large sums for its war funds Public finances are specially under the management of the government bank called the Banco Español, and have fallen into an unsatisfactory and confused state, consequent on the steps taken by the island government for obtaining funds by the emission of large amounts of notes without additional security, and without a special guarantee for each issue from the Madrid government, resulting in the depreciation of the paper, or a premium on gold and silver.

Money. The coins in use are chiefly the old Spanish *doblon*, or *onza de oro*, worth 16 silver dollars of Spain, but it is legal tender for 17 dollars in the island. Gold coins of half a doblon, *media onza*, of 8 dollars 50 cents, and of half and quarter that amount, and the *peso*, or dollar in gold or silver, are also in circulation. There is scarcely any smaller silver currency in Cuba, excepting the American 10-cent piece, or dime, called the *real sencilla*.

Weights and measures are those of Spain (q. v.). A hogshead of sugar = 1,300 lbs.; a bag of coffee = 150 lbs.; a pipe of tafia or rum = 120 gallons; and a bale of tobacco = 100 lbs.

Customs Duties. The tariff of *C.*, like that of Spain, is exceedingly complex, being divided into a great many classes, and embracing a vast number of articles, many of which are of very trifling importance. Most of the articles of import are valued at certain fixed rates, upon which the duties are charged at so much per cent. Hence, when the fixed or tariff prices exceed the real prices of the goods, the duties are proportionally increased, and conversely when the tariff prices are under the real prices. This tariff has been in part revised, but is still so deficient that disputes are constantly arising as to the classification of goods.

Customs Regulations. Every shipmaster is bound to have on his arrival, ready for delivery to the boarding officers of the revenue, a manifest, containing a detailed statement of his cargo and ship stores, and in the act of handing it over has to write thereon an oath that he has no other cargo on board, and the hour when he delivers it, taking care that it be countersigned by the boarding officers. Within 12 hours, which begin to count from the moment he delivers such manifest until 7 o'clock in the evening, and again from 6 o'clock in the

morning until the moment the said 12 hours elapse, he can make any alteration by *presenting a separate note* in which he specifies the errors he may have committed in the manifest. After the expiration of these 12 hours no alteration will be permitted. *Goods not manifested* will be confiscated without remedy; and if their value should not exceed $1,000, the master of the vessel will be liable to pay a penalty of double the amount of such non-manifested goods; if they exceed that sum, and belong to the master or come consigned to him, his vessel, freight, and other emoluments will be forfeited to the revenue. *Goods over manifested* will pay duties as if they were on board. *Goods not manifested, but claimed in time by a consignee*, will be delivered up to the latter, but the master in this case will be subject to a fine equal in amount to that of such goods. *Gold and silver* not manifested by either master or consignee are liable to a duty of 4 per cent. *Goods falling short* of the quantity manifested, when landed, and not being included in any invoice of consignee, will render the master liable to a penalty of $200 for each package so falling short. *Every master* must present himself, within 24 hours after his arrival, at the Custom House, in order to swear to his manifest, in neglect of which he is liable to a fine of $1,000. *Every consignee* is obliged to present a detailed note of goods within 48 hours after the arrival of a vessel; if not, such goods are liable to 2 per cent extra duty; the same is the case if such notes do not contain a statement of the number of pieces, contents, quantity, weight, and measure. Every vessel is required to bring a bill of health certified by the Spanish consul at the port of her departure, or that nearest to it, otherwise they are placed in quarantine. If the vessel arrive and sail in ballast, or without breaking bulk, she avoids the health visit, Morro light, tonnage, and mud-engine dues. If she bring cargo, the translation of manifest is more, according to its length, wharfage dues are incurred for the time of discharge, and the tide-waiters charge $5.50 for each day. Vessels taking entire cargoes of molasses pay no tonnage duty.

HAVANA, the capital and the most important city of the island, is situate in lat. 23° 8′ 15″ N., lon. 82° 22′ 45″ W. Its port is the finest in the West Indies, and one of the finest in the world. The entrance is narrow, but the water is deep, without bar or obstruction of any sort, and within it expands into a magnificent bay, capable of accommodating 1,000 large ships; vessels of the greatest draught of water coming close to the quays. The city lies along the entrance to, and on the W. side of, the bay. The suburb Regla is on the opposite side. The Morro and Punta castles, the former on the E., and the latter on the W. side of the entrance of the harbor, are strongly fortified, as is the entire city. The arsenal and dock-yard lie towards the W. angle of the bay, to the S. of the city. In the city, the streets are narrow and inconvenient; but in the suburbs, which are more extensive than the city itself, they are wider and better laid out. From its position, which commands both inlets to the Gulf of Mexico, its great strength, and excellent harbor, H. is, in a political point of view, by far the most important maritime station in the West Indies. As a commercial city, it also ranks in the first class; but it has long ceased to be, as it was formerly, the only port in the island for the exportation of sugar. The exports from Matanzas now usually amount to about a third part of those from H.; and there is also a considerable export from Cardenas, Trinidad, St. Jago de Cuba, Cienfuegos, and other ports. H., however, still engrosses the largest part of the foreign trade of the island. The exports from this port in 1878 were as follows: sugar in hogsheads, 150,472; sugar in boxes, 331,876; coffee, 14,400 lbs.; molasses in hogsheads, 9,333; honey, 154,109 gallons; wax, 197,075 lbs; aguardiente in casks, 9,403; paper cigars, 11,284,062 packages; cigars, 110,832,000; tobacco leaf, 12,640,-535 lbs. During that year 1,606 vessels entered the port, whose nationalities were as follows: Spanish steamers, 201; American, 299; English, 58; French, 25; German, 20; Swedish, 2; Spanish sailing vessels, 354; foreign, 757. Pop. 230,000.

MATANZAS, a seaport town of the N.W. coast, about 52 m. E. of Havana, in lat. 23° 3′ N., lon. 81° 40′ W. It is finely situated on both sides of the San Juan River, is strongly fortified, and ranks next to Havana in commercial importance. Pop. 36,000.

ST. JAGO DE CUBA, a seaport town, is situate on the river Santiago, 6 m. from its mouth, on the S. coast of the island, lat. 19° 55′ 9″ N., lon. 75° 50′ W. The harbor, 4 m. long, is fortified and well sheltered, and is next in commercial importance to the two above ports. Pop. 37,000.

Cuba Tobacco. See HAVANA TOBACCO.

Cube. See SQUARE.

Cubebs [Fr. *cubèbes;* Ger. *Kubeben;* It. *cubebi;* Port. *cobebas;* Sp. *cubebas*], the produce of *Piper cubeba*, a plant which is cultivated in Java, and grows also in Penang and other parts of the East Indies. It is a small unripe fruit, dried like a pepper-corn, but somewhat longer. *C.* have a hot, pungent, aromatic, slightly bitter taste, and a characteristic odor. They should be chosen large, fresh, sound, and the heaviest that can be procured. When *C.* have been kept long, especially in powder, they lose a portion of their volatile oil, on which, it appears, their medicinal properties depend. They are said to be adulterated with Guinea grains and pimento. *C.* are imported from Batavia and Canton, and are used in medicine. *Imp.* free.

Cubit, an English measure of length = 18 inches.

Cuca. See COCA.

Cuckoo-Clock, a kind of clock imported from Germany and Switzerland, in which the hours are sounded by wind proceeding through reeds which simulate the voice of the bird after which it is named. — *Knight.*

Cucumber [Fr. *concombre;* Ger. *Gurke;* It. *cetriuolo;* Port. *pepino;* Sp. *cohombro*], the cooling fruit of a well-known annual (*Cucumis sativus*) of which several varieties are cultivated in this country. It is chiefly used with us as a salad or condiment; but in Egypt, Syria, and other Eastern countries, where it is grown in fields, it forms a considerable part of the food of the lower classes, especially during summer; and its employment for this purpose is repeatedly noticed in Scripture. *Wild C.*, or *Squirting-gourd*, a perennial (*Momordica elaterium*), is a native of the S. of Europe. The fruit is oblong, about 1½ inches in length, and of a green color; and its juice yields the purgative substance known in medicine under the name of elaterium.

Fig. 117. — LABORATORY STILL.

A, *Cucurbite*, or boiler. B, *Alembic*, or head. S, *Condenser*, or worm-pipe.

Cucumber-Tree, a name given to the *Magnolia acuminata*, because its fruit when grown resembles a cucumber. It is about 3 inches long, and nearly 1 inch in diameter, and when steeped in whiskey it communicates a bitter to the spirit, which is drank as a preventive of autumnal fevers. The bark dried and prepared is also used for the same purpose.

Cucurbite, an earthen, glass, or copper vessel used in distillation (A in Fig. 117). It is usually in the form of a gourd, whence the name; but it is sometimes made shallow, with a wide mouth.

Cudbear, a purple or violet colored powder used in dyeing violet, purple, and crimson, prepared from a species of lichen (*Lecanora tartarea*), or crustaceous moss, growing commonly on limestone rocks in Sweden, Scotland, the North of England, etc. About 130 tons of this lichen are annually exported from Sweden. It commonly sells in the port of London for about $100 per ton; but to prepare it for use, it must be washed and dried; and by these operations the weight is commonly diminished a half, and the price, in effect, doubled. Though possessing great beauty and lustre at first, the colors obtained from *C.* are so fugitive that they ought never to be employed but in aid of some other more permanent dye, to which they may give body and vivacity. It is chiefly used to give strength and brilliancy to the blues dyed with indigo, and to produce a saving in that article; it is also used as a *ground* for madder reds, which commonly incline too much to yellow, and are made *rosy* by this addition. *Imp.* duty, free.

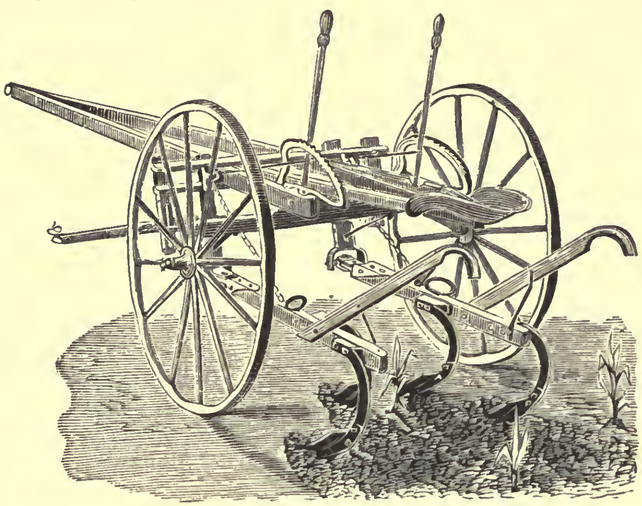


Fig. 118 — Cultivator.

Cue, the straight rod used in impelling balls at billiards. The end or *tip* with which the ball is struck is usually shod with vulcanite or leather.

Cuir, the French name for leather and hide.

Cuirasse, an armor for the body, usually of metal, and consisting of a breast and a back plate buckled together under the arms.

Cuir Color, the color of tanned leather.

Cuir de Lane, the French trade name for double-milled woollen cloth.

Culen, or **Koulin**, a name for the *Psoralea glandulosa*, the leaves of which have a medicinal reputation, and are used as a tea substitute.

Cull, to pick out, to select the best quality, to sample.

Cullet, the trade name for broken crown or flint glass, used in the manuf. of crown or window glass.

Cullings, or **Culls**, refuse lumber.

Culm, the stem of grasses. The term is also applied both to an inferior kind of anthracite only worked for making lime, or for mixing with clay, and to the small pieces of good anthracite obtained in working the true anthracite beds. It is also called *Blind Coal* and *Glance Coal.*

Cumbi, a kind of cloth made from the wool of the alpaca in Chili and Peru.

Cumana. See Venezuela.

Cultivator, an improved harrow consisting of a triangular frame set with teeth or shares, which, when the instrument is drawn along lands already ploughed, penetrate to the bottom of the furrow, and thoroughly pulverize the soil. The horse is hitched to the apex of the frame, and the implement is guided by a pair of handles at the rear. Fig. 118 shows one American form of *C.*, in which the ploughs are managed by levers in driving, and by the handles when walking behind the machine.

Cumberland. See Maryland.

Cumberland and Pennsylvania R.R., owned by the Consolidation Coal Co. of Maryland, whose offices are at Baltimore. Runs from Cumberland to Piedmont, Md., 38 m., Eckhart or Cumberland division, 14 m., Branch to Pennsylvania State line, 3 m. Total length of road owned and operated, 55 m. Operations of the Coal R.R. Co. are reported together to 31st Dec. 1878. *Financial statement:* Cap. stock $10,250,000; funded debt, $2,764,500. Net earnings from R.R. mines, etc., $354,525.49.

Cumberland Valley R.R. runs from Harrisburg, Pa., to Potomac River, Md., 82.20 m. This Co., whose offices are in Chambersburg, Pa., was chartered in 1831, and opened in 1837. *Financial statement:* Cap. stock, 1st preferred, $241,900; 2d preferred, $243,000; common, $1,292,950. Funded debt, $352,300, consisting of 1st mortgage 8% bonds, payable 1st April, 1904, $161,000; 2d mortgage 8% bonds, payable 1st April, 1908, $109,500; debenture 6% bonds, payable 1st Jan. 1884, $81,800. Net earnings for 1878, $49,007 17.

Cummin-Seed, the seeds of an annual plant (*Cuminium cyminum*, Linn.), a native of Egypt, but extensively cultivated in Sicily and Malta. They have a strong, peculiar, heavy odor, and a warm, bitterish, disagreeable taste. This seed, which formed a favorite ingredient in old English cookery, has been supplanted by more agreeable condiments. It was employed in medicine, and is still used in farriery. *Imp.* free.

Cuntline, the space between the bilges of two casks stowed side by side in a ship. Where one cask is set upon the *C.* between two others, they are stowed *bilge and cuntline.*

Cup, a small vessel to drink out of. A cupping-glass.

Cupel, and **Cupellation**. See Assay.

Cupola Furnace, a furnace for melting iron in a foundry. The cupola, or dome, leading to the chimney, to which it owes its name, is now frequently omitted.

Cupping-Glass, a small bell-like glass, used by surgeons in the operation of cupping. See Scarificator.

Cupule, the cup of the acorn *Quercus ægilops*, which enters largely into commerce as a tanning substance under the name of valonia.

Curaçoa, or **Curaçao**, a Dutch island in the

Caribbean Sea, lying off the N. coast of Venezuela, in lat. 12° N., lon. 69° W.; area, 212 sq. m.; pop. 23,972. The shores, which are bold, are in some places deeply indented, and present several harbors, the chief of which is Santa Anna, on the S. W. side of the island. The entrance to this is narrow, but the harbor itself is large and secure, and is the port of the chief town Curaçao, or Willemstad. The island is hilly and deficient of water, being wholly dependent upon the rains, yet, owing to the industry of the Dutch planters, considerable quantities of sugar, cotton, indigo, tobacco, and maize are raised. A peculiar variety of orange, the *Citrus aurantium curassuviensis*, grows abundantly, and furnishes the distinguishing ingredient in the following liqueur.

Curaçoa, a sweet and agreeable liqueur, made in great perfection by the Dutch from the peel of the orange peculiar to the above island. The *C.* of commerce is, however, generally made from any orange-peel digested in sweetened spirits, and flavored with cinnamon, and cloves or mace. The spirits employed in its manufacture are usually reduced to nearly 56 under proof, and each gallon contains about 3½ lbs. of sugar. *C.* varies in color; the darker kind being produced by digesting in it powdered Brazil-wood, and mellowing the color by caramel or burnt sugar.

Curarine, the vegeto-alkaline base of curara, urari, woorara, or wourali, the arrow-poison of Central America.

Curb, the part of the bit of a horse's bridle which serves to guide, restrain, or manage him.

Curb-Bit, a stiff bit having *branches* by which a leverage is obtained upon the jaws of a horse. The lower end has rings or loops for the reins, and the upper end has loops for the *curb-chain* and the *check-straps* of the headstall. The curb-chain has usually twisted links, and is fast by one end to the loop of the *off* branch, and is hooked to the loop of the *near* branch. It forms the fulcrum for the leverage of the branches. — *Knight.*

Curb-Chain, a small chain passing from the bridle under the head of a horse. A kind of gold watch-guard.

Curcumine, the yellow coloring-matter of turmeric, obtained by digesting the alcoholic extract of the powder in ether, and evaporating the clear ethereal solution to dryness. A brownish-yellow mass, yielding a bright-yellow powder. It is scarcely soluble in water, but very soluble in both alcohol and ether. Boracic and hydrochloric acids redden it; alkalies turn it reddish brown.

Curd, the common name for the caseine of milk, a solid substance separated from milk by acids, which resembles albumen in several of its properties. It is the basis of cheese, contains nitrogen, and is highly nutritious. See CHEESE.

Curd-Cutter, a machine with revolving knives on a spindle or axis, for cutting the curd, and separating whey from the curd in cheese-making.

Cured, preserved from decay or corruption, as by drying, salting, jerking, etc.

Curing, the process of slightly salting meat, etc. — Also the operation of freeing newly potted sugar from its molasses prior to shipment, which, on sugar estates, is performed in buildings called curing-houses.

Curled-Hair. See HAIR.

Curling-Irons, iron tongs having one round member and one semi tubular, between and around which, after they are heated in the fire, hair is wound to curl it.

Curly-Maple, the timber of a variety of maple, *Acer saccharinum*, used for cabinet work, and so called from the fibres curling at the places where branches have shot out from the trunk of the tree.

Currant [Fr. *groseille;* Ger. *Johannisbeere;* It. *ribes;* Sp. *grosella*], a hardy berry, produced by a bush (*Ribes*) common in our gardens. There are two species; one of a red or yellow color (*R. rubrum*), remarkable for its mixture of sweetness and acidity; the other of a black color (*R. nigrum*), without acidity, but containing a powerful and agreeable aromatic principle. Of the former, the finest varieties are, Wilmot's red, the White Dutch, Knight's sweet red, and the common white; of the latter, the best is the Black Naples. These currants are employed in confectionery, and in the manufacture of a kind of wine.

Currants [Fr. *raisins de Corinthe;* Ger. *Korinthen;* It. *uve passe di Corinto;* Port. *uvas de Corintho;* Sp. *pasas de Corinto*], the raisins of a small seedless grape, growing in huge bunches, often as much as 18 inches long, and of proportionate breadth. They are trod into large casks, and exported. Enormous quantities are cultivated in the Grecian islands, principally in Corfu, Zante, and Ithaca. Originally, Corinth was the principal place where they were raised, whence the name "corinths," from which the word "currants" has been derived. They are extensively used in the making of puddings, confectionery, etc. *Imp.* duty, 1 cent per lb.

Currency, the paper money and coin established as, and passing for, the circulating medium of a country. See MONEY. See also GOLD, LEGAL TENDER NOTES, NATIONAL BANKS, and SILVER.

Current [from Lat. *curro*, to run, to flow] literally signifies running, flowing, passing. Hence, passing from person to person, or from hand to hand; circulating, as *C.* opinions, *C.* coin. In commerce it is applied in an analogous sense to the price of any commodity: as *C.* value, — that is, the ordinary or present value. As applied to time, it is equivalent to now present or passing: as the *C.* month or year. It is applied chiefly to the progressive movement of fluids, especially of air, electricity, and water.

Curricle, an open two-wheeled carriage drawn by a pair of horses.

Currier [Fr. *corroyeur;* Ger. *Zurichter*], one who curries and dresses leather after it is tanned.

Currier's-Knife, a large, two-handled knife, with a recurved edge, used by curriers for shaving or paring the flesh sides of hides.

Curry, a noted dish in Indian cookery, much esteemed throughout the East. Curries are simply stews, of which rice usually forms a characteristic ingredient, highly flavored with fried onions and curry powder, to which sliced apples and lemon-juice are sometimes added. They are made from every variety of fish, meat, poultry, game, etc., according to the fancy of the parties. *Imp.* free.

Curry-Comb, an iron scraper for rubbing down and cleaning the coats of horses.

Currying [Fr. *corroyage;* Ger. *Zurichten*], the art of dressing skins after they are tanned, for the purposes of the shoemaker, coach and harness maker, etc., or of giving them the necessary smoothness, lustre, color, and suppleness. The currier's shop has no resemblance to the tanner's premises, having a quite different set of tools and manipulations. Every kind of tanned leather not intended for soles or such coarse purposes is generally curried before being delivered to the workmen who fashion it, such as shoemakers, coachmakers, saddlers, etc.

The chief operations of the currier are four: 1. Dipping the leather, which consists in moistening it with water, and beat-

ing it with the *mace*, or a mallet, upon the hurdle. He next applies the *cleaners*, both blunt and sharp, as well as the head-knife, to remove or thin down all inequalities. After the leather is shaved, it is thrown once more into water, and well scoured by rubbing the grain side with pumice-stone, or a piece of slaty grit, whereby it parts with the bloom, a whitish matter derived from the oak bark in the tan-pit. 2. Applying the pommel to give the leather a granular appearance, and correspondent flexibility. The leather is first folded with its grain side in contact, and rubbed strongly with the pommel, then rubbed simply upon its grain side; whereby it becomes extremely flexible. 3. Scraping the leather. This makes it of uniform thickness. The workman holds the tool nearly perpendicular upon the leather, and forcibly scrapes the thick places with both his hands. 4. Dressing it by the round-knife. For this purpose he stretches the leather upon the wooden cylinder, lays hold of the pendent under edge with the pincers attached to his girdle, and then with both hands applies the edge of the knife to the surface of the leather, slantingly from above downward, and thus pares off the coarser fleshy parts of the skin. This operation requires great experience and dexterity, and when well performed, improves greatly the look of the leather. — The hide or skin, being rendered flexible and uniform, is conveyed to the shed or drying-house, where the greasy substances are applied, which is called dubbing (daubing) or stuffing. The oil used for this purpose is prepared by boiling sheepskins or doeskins in cod oil. This application of grease is often made before the graining-board or pommel is employed. Before waxing, the leather is commonly colored by rubbing it with a brush dipped into a composition of oil and lamp-black on the flesh side, till it is thoroughly black; it is then black-sized with a brush or sponge, dried, tallowed with the proper cloth, and slicked upon the flesh with a broad, smooth lump of glass; sized again with a sponge; and when dry, again curried as above described. *C.* leather on the hair or grain side, termed black on the grain, is the same in the first operation with that dressed on the flesh, till it is scoured. Then the first black is applied to it while wet, by a solution of copperas put upon the grain, after this has been rubbed with a stone; a brush dipped in stale urine is next rubbed on, then an iron slicker is used to make the grain come out as fine as possible. It is now stuffed with oil When dry, it is seasoned; that is, rubbed over, with a brush dipped in copperas-water, on the grain till it is perfectly black. It is next slicked with a good grit-stone, to take out the wrinkles and smooth the coarse grain. The grain is finally raised with the pommel or graining-board, by applying it to the leather in different directions. When thoroughly dry, it is grained again in two or three ways. Hides intended for covering coaches are shaved nearly as thin as shoe hides and blacked upon the grain.

Curry-Powder, a seasoning or condiment, originally prepared in the East Indies. The *C. P.* prepared in England consists of coriander-seed, turmeric, cayenne, fenugreek-seed, and a large proportion of sago-flour. It should be kept in a bottle closely corked or stoppered. *Imp.* free.

Curtain [Fr. *rideau;* Ger. *Vorhang*], a cloth hanging at a window, round a bed, or in a theatre, which may be contracted or expanded at pleasure.

Window-*C.* are made in great variety, both of materials and manufacture, the principal difference being as to the former, which consist chiefly of silk, wool, or cotton. Silk is employed in *damasks* and *tabarets*, mixed with wool, the former being a flowery pattern of silk on a woollen foundation, whilst the latter is a satin stripe arranged in the same way as regards the composing materials. A species of *terry-velvet* is also used in which the two materials are blended, and which makes a rich and elegant *C.*; this is made also in wool without silk, and then called *rep.* When wool is used by itself, it then forms a *broadcloth* suited to dining-rooms, or a damask which is not so beautiful to the eye as the *silk damask*, but still sufficiently so for common purposes, or else a *moreen*, either plain or watered, or a *challi*, which is a thin twill material, printed with chintz patterns. Cotton is made into a plain article, without anything but a mere web and woof, which, when printed and glazed, is called chintz.

Curtain-Paper, a heavy paper, printed and otherwise ornamented, for window-shades.

Curvilinear, a drafting-instrument used in describing irregular curves. The various shapes of its marginal outline enable it to be fitted into position so as to project or transcribe the curve required. M. Desalier, of Paris, invented a machine for generating the curves and marking out the patterns. It is capable of making 1,200 varieties of curve.

Cusco Bark, a variety of Peruvian bark, with a white epidermis, and orange-red cortical layers, yielding an alkaloid called Aricina.

Cuscus Root, sometimes written "Kuskus," a commercial name for the fragrant rhizoma obtained from a grass, the *Andropogon muricatus*, which, when wetted, emits a strong, penetrating, agreeable odor, and is used for making mats, fans, etc. The leaves, like those of the lemon grass, yield an aromatic stimulant essential oil, known as vitever.

Cush, one of the Indian names for the *Sorghum vulgare*, a species of millet.

Cushion, the padded side of a billiard-table. — A pillow or air-case for the seat of a chair, sofa, carriage, etc.

Cusparia Bark. See Angostura Bark.

Custard, a sweetened cream made of milk, eggs, and spice.

Custard-Apple, a name applied to the fruit of various small trees of the genus *Anona*. The fruit of *A. reticulata*, the common *C. A.*, or "bullock's heart," of the West Indies, is dark brown in color, and marked with depressions, which gives it a quilted appearance; its pulp is reddish-yellow, sweetish and very soft. It is sometimes as large as an orange, but usually more like a plum. The kernels of the seeds are said to be poisonous.

Custard-Powder, a dry material for making custards, used instead of eggs.

Custom, the patronage or support accorded to a trading establishment; patronage.

Customer, a regular and accustomed buyer of goods of any trading firm or house.

Custom-House, the house or office where commodities are entered for importation and exportation; where the duties, bounties, or drawbacks payable or receivable upon such importation or exportation are paid or received; and where ships are cleared out, etc. The most important American *C. H.* is that of New York, but there are *C. H.* in all considerable seaport and a few inland cities. For information as to the proceedings necessary at the *C. H.* on importing or exporting commodities, see Exportation, Importation, and Warehousing. See also Shipping, Smuggling, Tariff, etc.

Custom-House Broker, a person who acts for merchants in the business of entering and clearing goods and vessels, and in the transaction of general business at the custom-house. The forms required to pass goods through the custom-house are complicated; and it is difficult for persons unaccustomed to the business to understand the necessity of passing from one desk to another, and from one department to another, merely to obtain the initials of a clerk, or the stamp or signature of an officer. Many a one, who, in order to save a few dollars, tries to perform the business himself, gives it up before he is half through, and is glad to avail himself of the services of a broker. — *T. McElrath.*

Custom-House Entry. See Importation.

Customs Duties are taxes charged upon commodities on their being imported into or exported from a country. They rank among the most ancient, as they continue to prevail as one of the most common, modes in all countries of levying revenue for public purposes. The Athenians laid a tax of a fifth on the corn and other merchandise imported from foreign countries, and also on several of the commodities exported from Attica. The *portoria*, or customs payable on the commodities imported into and exported from the different ports in the Roman empire, formed

a very ancient and important part of the public revenue. The rates at which they were charged were fluctuating and various, and little is now known respecting them. Cicero informs us, that the duties on corn exported from the ports of Sicily were, in his time, 5 per cent. Under the imperial government, the amount of the *portoria* depended as much on the caprice of the prince as on the real exigencies of the state. Though sometimes diminished, they were never entirely remitted, and were much more frequently increased. Under the Byzantine emperors, they where as high as 12½ per cent. Customs duties existed in England previous to the Conquest. They appear to have derived their name from having been immemorially or customarily charged on certain articles when conveyed across the principal ferries, bridges, etc., within the kingdom, and on these and other articles of native and foreign produce when exported from or imported into the kingdom. Some European governments distinguish in their rates of duty between "dry" or land ports and "wet" or sea ports; and others vary their dues on foreign commodities according to the zones of the globe from which the commodities come. Nothing, on the whole, is more perplexing to the merchant than customs duties, chiefly in this country. They are a labyrinth through which he has to steer with caution and circumspection; while at the same time it offers to the more unscrupulous traders temptations to fraud. The smuggling which proceeds under customs duties is only to be checked by the most careful administration, by a system proceeding as far as possible on the simplicity of generally recognized principles, and by duties so moderate in amount as to reduce to a minimum the temptation of fraud. A customs duty on the *import* of commodities has to be paid by the domestic consumers of the commodities. The foreign producer will not sell them at less than they cost, and the importing merchant will not bring them in unless he obtain this cost, his own fair profit, and the import duty over and above these essential constituents of the transaction. An import duty is thus in some cases a tax which consumers may pay lightly or heavily as they choose, and has accordingly a flexibility that is not unimportant in taxation. But if the commodity be one of domestic as well as foreign supply, the effect of the customs duty is to raise the price of the domestic supply in some proportion to the duty; and the consumer, in so far as the commodity is one of necessity to him, has no choice. He has to pay the tax, with the further dissatisfaction of knowing that it goes to no public purpose, but only into the pockets of some of his own private neighbors. A customs duty on the *export* of commodities, on the other hand, has to be paid by the foreign consumers, one of the most agreeable forms of taxation to be conceived. But this desire of taxing foreigners for domestic revenue is met by the competition of general commerce, and nations have to be chary of levying duties on the export of the products of their own industry. It is only where they have some special monopoly of the product that they can enter upon such a course without the gravest disadvantage to themselves.

The tariff of the U. States is separately given in this work, under the name of each article of importation. The following table gives an account of the customs duties received on all commodities (exclusive of specie) imported from foreign countries and entered for consumption in the U. States for the 12 years 1867–1878; the expression "entered for consumption" merely implying the delivery of the imported goods from the custody of the custom officers to the importer.

Year ended June 30 —	Value of merchandise.			Amount of duty collected.	Average ad-valorem rate of duty collected on —	
	Free of duty.	Dutiable.	Total.		Dutiable.	Free and dutiable.
	$	$	$	$		
1867	17,083,130	361,125,553	378,158,683	168,503,750	46.667	44.559
1868	15,147,618	329,661,302	344,808,920	160,552,779	48.696	46.557
1869	21,682,532	372,756,642	394,449,174	176,557,584	47.365	44.761
1870	20,214,105	406,131,905	426,346,010	191,513,954	47.156	44.919
1871	40,619,064	459,596,058	500,216,122	202,446,673	44.049	40.472
1872	47,083,747	512,735,297	560,419,034	212,619,105	41.468	37.984
1873	178,389,796	484,746,861	663,146,657	184,929,042	38.149	27.890
1874	151,684,834	415,748,693	567,443,527	160,522,285	38.610	28.288
1875	146,465,463	379,795,113	526,260,576	154,554,983	40.694	29.368
1876	140,561,381	324,024,926	464,586,307	145,178,003	44.805	31.249
1877	140,840,149	298,069,240	438,909,389	128,428,343	42.954	29.190
1878	141,359,059	297,063,409	438,422,468	127,195,159	42.815	29.012

Customs of Merchants. The law merchant is a peculiar system which prevailed throughout the whole of the Anglo-Saxon times; it was especially recognized in the time of Edward III.; when the staple was ordained, a mayor was to be chosen in each town, skilled in the law merchant to do right to every man according to that law. The modern law merchant is composed of three distinct elements, viz., the *customs* of merchants, the ordinances of foreign states, and the statute law, — as art precedes science, so customs precede law. Long are these customs practised before they are committed to writing. But though not written or declared by the legislative power, they acquire all the authority of law, and are gradually engrafted upon the common law of the country. The customs of merchants are part of the law. Judicial determinations settle what is the custom of merchants, and they become the *lex mercatoria* as to the different questions. In order that a custom be binding, it must be either the usage of the whole mercantile world or of a particular trade universally known as such. A usage of a particular place, or of a particular class of persons, would not be binding on other persons unless these were acquainted with those usages and adopted them. In all cases, however, no custom can be set against an express statute law. Among the most important customs among merchants are the establishment of boards of trade, the settlement of disputes by arbitrations, and the binding force of the decision of a referee.

Cut, a picture cut or carved upon a block or stamp of wood or copper. — A Scotch term for a skein or quantity of yarn.— Also the style of the notches of a file; as, *rough, bastard, second, smooth, dead-smooth* cuts.

Cutch. See CATECHU.

Cut-Glass. See GLASS.

Cutlass, a broad curving sword used chiefly by seamen in boarding or repelling boarders.

Cutlery [Fr. *coutellerie;* Ger. *Messerschmiedewaaren*] is a branch of industry which originally embraced the manufacture of all cutlery implements of whatever form and materials. The progress of manufacturing industry has, however, detached from it the fabrication of several kinds of edge-tools, saws, and similar implements, the manuf. of which is now regarded as distinct branches of trade. On the other hand, modern *C.* includes a great number of articles which are not strictly cutting implements, but which, owing to their more or less intimate relation to table or pocket *C.*, are classed with such articles for con-

venience' sake. A fork, for example, is an important article of *C.*, although it is not a cutting tool. From the earliest period in English history the manuf. of *C.* has been peculiarly associated with the town of Sheffield, and at the present day that town not only practically monopolizes the ordinary *C.* trade of Great Britain, but still remains the chief centre of the industry for the whole world. The French, however, have an uncontested superiority in the manufacture of surgical instruments. The American manufacture of pocket *C.* has not reached that degree of excellence and superiority which now commands the European markets for our edge-tools, and we have still to import the best pocket *C.* from England; but the American table *C.* is not inferior to the English. In 1878 the value of *C.* imported (almost entirely from England and Germany) was $1,161,-382, while our exports (chiefly to Central and South America) were $54,812. *Imp.* duty, 35 per cent.

Manuf. The variety of materials which go to complete any single article of *C.* is very considerable; and as the stock-list of a cutler embraces a vast number of articles different in form, properties, and uses, the master cutler must have a special knowledge of a wide range of substances. The leading articles of the trade may be classed under, — 1st, domestic *C.*, which includes carving and table knives and forks, pocket or clasp knives, razors, scissors, and similar articles; and 2d, tool *C.*, under which head may be arranged surgical knives and lancets, butchers' and shoemakers' knives, gardeners' pruning-knives, and a vast number of other allied cutting implements. The blades or cutting portions of a certain number of these articles are made of shear-steel, and for others cast steel only is employed. Sometimes the cutting edge alone is of steel, backed or strengthened with malleable iron, to which it is welded. Tongs on which handles are fastened, and other non-cutting portions, are also very often of malleable iron. Brass, German silver, silver, horn, tortoise-shell, ivory, bone, mother-of-pearl, and numerous fancy woods are all brought into requisition for handles and other parts of *C.*, each demanding special treatment according to its nature. The essential processes in making a piece of steel *C.* are, — 1st, forging; 2d, hardening and tempering; 3d, grinding; and 4th, polishing; and to these of course are added the divers operations of fitting and handling of various kinds. — The following outline of the steps in the manuf. of a razor will serve to indicate the sequence of operations in making an article which, though simple in form, demands the highest care and skill in the departments which strictly appertain to *C.* The first essential of a good razor is that it be made of the finest quality of cast steel. A razor must further present due proportions, form, temperature, fitness, and regularity of concavity. The steel for razors is obtained in bars half an inch in breadth, and the thickness of the back of the instrument. Such a bar the forger takes, and, heating one end of it to the proper forging temperature, he with great dexterity fashions it upon his anvil, giving it roughly the required form, edge, and concavity. It is then separated from the remainder of the bar, leaving only sufficient metal to form the tang, if that is to be made of steel; sometimes a tang of malleable iron is welded to the blade. The tang of the "mould," as the blade in this condition is termed, is next drawn out, and the whole "smithed," or beaten on the anvil, to compact the metal and improve the form and edge of the razor. At this stage the razor is said to be "forged in the rough," and so neatly can some workmen finish off this operation that a shaving edge may be given to the blade by simple whetting. The forged blade is next "shaped" by grinding on the dry stone, in which operation it is considerably reduced in weight, and the oxidized scale is removed, which allows the hardening and tempering to be done with certainty and proper effect. The shaped razor is now returned to the forge, where the tang is file-cut and pierced with the joint-hole, and into the blade is stamped either the name and corporate mark of the maker, or any mark or name ordered by the wholesale merchant for whom the goods are being manufactured. The hardening is accomplished by heating the blade to a cherry-red heat and suddenly quenching it in cold water, which leaves the metal excessively hard and brittle. To bring it to the proper temper for a razor, it is again heated till the metallic surface assumes a straw-color, and upon plunging it into water it is ready for the process of wet grinding. The wet grinding is done on stones which vary in diameter from 4 to 12 inches according to the concavity of surface desired. "Lapping," which is the first stage in polishing, is performed on a wheel of the same diameter as the wet-grinding stone. The lap is built up of segments of wood having the fibres towards the periphery, and covered with a metallic alloy of tin and lead. The lap is fed with a mixture of emery powder and oil. "Glazing" and "polishing," which follow, are for perfecting the polish on the surface of the razor, leather-covered wheels with fine emery being used; and the work is finished off with crocus. The finished blade is then riveted into the scales or handle, which may be of ivory, bone, horn, or other material; and when thereafter the razor is set on a hone, it is ready for use. — The processes employed in making a table knife do not differ essentially from those required for a razor. Knife-blades are made from shear-steel, and, after forging the blade, a piece of malleable iron sufficient for the bolster or shoulder and tang is welded to it. The bolster is formed with the aid of a die and swage called "prints," and the tang is drawn out. The tang is variously formed, according to the method by which it is to be secured in the shaft, and the various processes of tempering, wet grinding, and polishing are pursued as described above. Steel forks of an inferior quality are cast and subsequently cleaned and polished, but the best quality are forged from bar steel, and the prongs are cut or stamped out of an extended flattened extremity called the mould or "mood." In the U. States machinery has been extensively adapted for performing the various mechanical operations in forging and fitting table cutlery. In the making of a common pocket-knife with three blades not fewer than one hundred separate operations are involved, and these may be performed by as many workmen. The diversity of quality and workmanship is probably greater in the *C.* trade than in any other, although differences are not readily apparent to the unskilled critic, and the range of prices is correspondingly wide. — *C.* grinding, which is one of the most important and distinctive departments of the trade, possesses the bad eminence of being one of the most unhealthy and deleterious of all occupations. Grinders are divided into three classes, — dry, wet, and mixed grinders, according as they work at dry or wet stones. This branch of trade, in large manufactories, is conducted in distinct establishments called "wheels," which are divided up into separate apartments or "hulls," dry grinding being as much as possible separated from the wet grinding. Dry grinding, such as is practised in the shaping of razors described above, the "humping," or rounding of scissors, and other operations, is by far the most injurious and fatal process. Red-hot particles of steel fly off, injuring and sometimes blinding the eyes, unless they are protected; and the atmosphere is loaded with fine dust of silica and steel, inducing inflammation of the lungs, pleurisy, and grinders' asthma. The men work in a peculiarly constrained position, and under highly unsanitary conditions; and although a fan has been invented and extensively introduced which, placed behind the stones, by suction draws away a large proportion of the grinding dust, and renders the atmosphere comparatively pure, many grinders still neglect to keep it working or positively refuse to have it.

Cutlings, a name for groats, bruised oat seeds freed of the pericarp, used for gruel, porridge, etc.

Cut-Meats, an American term for certain cured meats, hams, shoulders, etc.

Cut-Nails, nails made by machinery, instead of wrought by hand from rods.

Cut-Off, a term applied to that mode of using steam or other elastic fluid in which it is admitted to the cylinder during a portion only of the stroke of the piston; the steam, after the induction ceases, working expansively in the cylinder during the remainder of the stroke of the piston. — *Knight.*

Cuttee, a bin to hold weaver's quills.

Cutter, a sharp, light-built vessel, with one mast, running bowsprit, and fore and aft sails. *C.* are chiefly used as cruisers after smugglers, for conveying despatches to a fleet, and for private sailing yachts. — A tailor's assistant. — A piercing instrument used in boring for water.

Cutter (Revenue), a sloop belonging to the Customs, employed on the coast to prevent smuggling.

Cutters, a description of brick, also called firsts or marle-stocks, 8¾ inches long by 4¼ broad and 2¼ thick, chiefly used for the arches of windows, doorways, quoins, etc.

Cuttie, Cutty, a Scottish term for short; hence it is frequently applied as an adjective, as cutty-pipe, cutty-stool, etc.

Cuttie-Stoup, a pewter vessel holding the 8th part of a Scotch chopin or English quart.

Cutting-leaf Tobacco, a new variety of tobacco, raised near Cincinnati, on both sides of the Ohio. The leaf, shaded down from a yellowish hue to a dark-red color, is much esteemed for plug purposes.

Cutting-Plane, a carpenter's smoothing tool.

Cuttle-Fish [Fr. *seiche*; Ger. *Dintenfisch*], the

sepia, a cephalopodous animal, of which there are several species inhabiting the seas of all quarters of the globe. They are able to exercise considerable locomotive powers, by means of their tentaculæ or arms which surround the mouth, and which are usually provided with numerous suckers. Head downward, they walk on these arms at the bottom of the ocean. The *sepias* are also fleet swimmers; effecting their progress through the water either by making the expansion of their skin perform the same office as fins, or by the forcible projection of water from the cavity of their mouths, the reaction accompanying which operation drives them rapidly through the water in a different direction. They are provided sometimes with 8, and sometimes with 10, tentaculæ, and have naked bodies. The black fluid which the animal is capable of ejecting from its ink-sac, when pursued by its enemies, was formerly employed in the manufacture of the pigment called from its source "sepia." The bone or skeleton of the *Sepia officinalis* (Fig. 119), or common cuttle-fish, is used to erase ink-marks from paper and parchment. Reduced to powder, it forms a valuable dentifrice and polishing powder, and also for forming the moulds for small silver castings. Large supplies are received at Bombay from the Persian Gulf. *Imp.* free.

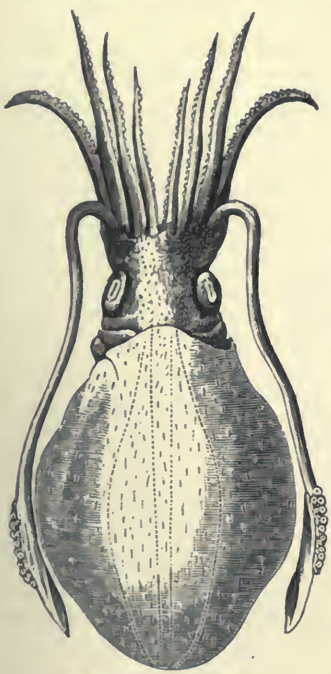


Fig. 119. — Cuttle-Fish.

Cutty-Pipe, a short tobacco-pipe.

Cutwater, the knee of the head of a ship; the foremost part of the prow which projects forward off the bows.

Cuvette, in glass manufacture, a basin for receiving the melted glass after it is refined, and decanting it on to the table to be rolled into a plate.

Cwt., the commercial abbreviation for centum and weight, which is 112 lbs.

Cyanide Powder. See Potassium.

Cyanometer, an instrument for determining the deepness of the tint of the atmosphere.

Cylinder, a long round case or body; the glass barrel of an electrifying machine; the body of a pump, etc.

In *steam-engines*, the *C.* is that part of the engine in which the piston works, and from which, by alternately admitting and condensing the steam, all the power of the machine is derived. The boring of cylinders for steam-engines requires very powerful and accurate machinery. The cylinder is cast hollow, and the object of the boring-machine is to produce a true *C.* with an even surface, so that the piston may fit exactly and work freely. Some machines for this purpose act horizontally and others vertically; while the cutters revolve and advance by the action of some powerful prime mover. This operation is generally repeated three times, in the last of which the greatest care is required. — The *C. cover* is the lid bolted to a flange round the top of a cylinder, so as to be perfectly steam-tight; it has a stuffing-box cast in the centre, through which the piston-rod alternates.— The *C. cocks* are cocks placed in convenient parts of the cylinder for admitting oil to lubricate the piston; or by which to blow out the condensed steam, or any deposit in cylinders.

Cylinder-Glass. See Glass.

Cymbals, musical clappers, concave brass plates used in military bands for producing a clashing sound. *Imp.* duty, 30 per cent.

Cypress, a forest-tree, the most important species of which are the evergreen *C.* (*Cupressus sempervirens*), a native of the S.E. part of Europe and Asia; the white cedar of the southern parts of North America (*Cypressus thyoides*), and the *C.* of California (*Cupressus Lawsoniana*). The *C.* grows to a great size, and is a most valuable species of timber. It is never attacked by worms, and exceeds all other trees, even the cedar, in durability. It is said to live to a great age; and this circumstance, combined with its thick, dark-green foliage, has made it to be regarded as an emblem of death and the grave. The white cedar, common in many parts of the Southern States and in Mexico, loves the deepest, most gloomy, inaccessible swamps; and south of 33° is generally found covered with sable festoons of long moss, hanging, like shrouds of mourning wreaths, almost to the ground. It seems to flourish best when water covers its roots for half the year. Unpromising as are the places and circumstances of its growth, no tree of the country where it is found is so extensively useful. It is free from knots, it is easily wrought, and makes excellent planks, shingles, and timber of all sorts It is very durable, and incomparably the most valuable tree in the southern part of the Mississippi Valley. *C.* boards are preferred to those of pine for the inside of brick houses, and for window-sashes, and the panels of doors exposed to the weather; cabinet-makers also choose it for the inside of mahogany furniture. It is highly proper for the masts and sides of vessels, and wherever it grows it is chosen for canoes, which are fashioned from a single trunk, and are often 30 feet long and 5 feet wide, light, solid, and more durable than those of any other tree. It makes the best pipes to convey water under the ground, especially the black variety, which is more resinous and solid.

Cyprus, a large island in the Mediterranean, ceded by Turkey to Great Britain in 1878. It is situated nearly at equal distance from the coasts of Asia Minor to the N., and Syria to the E. The headland of Cape Kormakiti, in *C.*, is distant about 46 m. from Cape Anamur, in Cicilia, and its N. E. point, Cape St. Andrea, is about 60 m. from Latakieh, in Syria. In lies between lat. 34° 30′ and 35° 40′ N., and between lon. 32° 15′ and 34° 35′ E. Its greatest length is about 145 m., from Cape Drepano in the W. to Cape St. Andrea in the N. E.; and its greatest breadth, from Cape Gata in the S. to Kormakiti in the N., reaches nearly 60 m., while it retains an average width of from 35 to 50 m. through the greater part of its extent, but narrows suddenly to less than 10 m. in about 34° lon., and from thence sends out a long narrow tongue of land towards the E. N. E. for a distance of more than 45 m., terminating in Cape St. Andrea. It is the third largest island in the Mediterranean, considerably exceeding in area both Corsica and Crete. Great part of the island is occupied by two mountain ranges, both of which have a general

direction from W. to E. Of these, the most extensive as well as the most lofty is that which fills up almost the whole S. portion of the island, and is generally designated by modern geographers as Mount Olympus, though that name appears to have been applied by the ancients only to a somewhat isolated peak called Oros Stavro, or Hill of the Holy Cross, which is only 2,300 feet high, while the highest summit of the range, known as Mount Troödos, attains an elevation of 6,590 feet. The N. range of mountains begins at Cape Kormakiti, and is continued from thence in an unbroken ridge to the E. extremity of the island, Cape St. Andrea, a distance of more than 100 m. Between these two mountain ranges lies a broad tract of plain, extending quite across the island, from the Bay of Famagosta to that of Morphu on the W., through a length of nearly 60 m., with a breadth varying from 10 to 20 m. It is known by the name of Messaria, and is watered by two streams, both of which descend from the mountains on the south; but on reaching the plain the one turns eastward and flows into the Bay of Famagosta, close to the ruins of Salamis, the other flows westward into the Bay of Morphu. The greater part of this plain is open and uncultivated, and presents nothing but barren downs; but corn is grown in considerable quantities in the northern portions of it, and there is no doubt that the whole is readily susceptible of cultivation. It is remarkable that *C.* was celebrated in antiquity for its forests, which not only clothed the whole of its mountain ranges, but covered the entire central plain with a dense mass, so that it was with difficulty that the land could be cleared for cultivation. At the present day the whole plain of the Messaria is utterly bare and treeless, and it is only the loftiest and central summits of Mount Olympus that still retain their covering of pine woods. The disappearance of the forests has naturally affected the rivers, which are mostly mere torrents, dry in summer. The most considerable is that called in ancient times the Pediæus, which, as already mentioned, traverses the plain of the Messaria, and falls into the sea near Salamis. But even this does not reach the sea in summer, and its stagnant waters form marshes which contribute much to the unhealthy character of the plain. Considerable part of the wealth of ancient *C.* arose from its copper-mines, the most important of which were those of Tamasus in the centre of the island, Soli on the north coast, and Amathus and Cyrium on the south coast. In these mines gold and silver were also found. The precious stones of *C.* were also highly valued. The chief of these were the emerald, agate, malachite, jasper, opal, and the minerals asbestos and rock crystal. — *C.* was noted among the ancients for its fertility and beauty; and under the Venetian rule it carried on an extensive trade in its various natural productions; but this has greatly declined in modern times. Besides corn, however, the island exports considerable quantities of wine, oil, madder, the fruit of the carob-tree, silk, and wool. Tobacco and cotton are also grown in small quantities, and their cultivation might doubtless be largely increased. The small plains at the foot of the range of Mount Olympus, between the underfalls of the mountains and the sea, as well as the narrow strip of level land along the north coast, though limited in extent, are districts of great fertility; the latter especially is described as one of the most beautiful and best cultivated districts in Turkey. The great central plain, on the contrary, is in many parts marshy and unhealthy; and, indeed, the whole interior of the island suffers much from unhealthiness, and is subject to fevers of a peculiarly dangerous description. — One of the greatest disadvantages of *C.* is the want of ports, there not being a good natural harbor in the whole island. Larnaca and Limasol, which are the chief places of trade at the present day, have nothing but mere roadsteads; and Salamis, which was the chief port of the island in antiquity, as well as Famagosta, which held that position under the Venetians, were only artificial harbors upon an open sandy coast. Tzerinia, on the N. coast, which serves as the place of direct communication with the mainland of Asia Minor, has a very small and bad port, which, bad as it is, is the only one on this side of the island. — The small town of Lefkosia, or, as it is more commonly called, Nicosia, has, since the time of the Lusignan kings, been the capital of the island. The increasing commerce of the Western nations of Europe with the Levant has given some stimulus to trade in *C.*, and encouraged the cultivation of the natural productions of an island which, under British rule, may become one of the richest in the Mediterranean. The population, which, before English occupation, was estimated at about 135,000 souls, of which about two thirds were Greeks and the rest principally Turks, is now about 200,000.

Cyprus Wines. These wines, formerly so highly appreciated by connoisseurs, are now little known. The best, which much resembles Tokay, is still called the wine of the Commandery, and is raised in the country between Limasol, Paphos, and Mount Olympus range, which was anciently occupied by the Commandery of the Templars and the Knights of Malta. This wine, made from grapes of a red color, fines itself by age, so that at 8 or 10 years old it is of the same yellow hue as the sweet wines of Southern Europe. After 60 or 70 years it becomes as thick as sirup. Its age may be known by pouring it into a glass, and observing whether particles like oil adhere to the sides; this cannot be produced by art. It is often adulterated with luscious wines and perfumes. Cold is injurious to the quality of the wine; it should be placed before a fire, if drunk in the North during autumn and winter. One very remarkable circumstance attached to the wines of *C.* is the value of the lees: they are always exported with the wine, if possible. Before bottling, a month or two of rest must be given to the cask, that they may subside. They settle with greater difficulty abroad than in their native island. The casks must be pierced above the dregs, and the wine will come off limpid; but this should only be done for bottling. The wine deposits no tartar on the cask, but the dregs or lees are sometimes a mixture in color of black, red, and yellow, of the consistence of paste, but generally of the hue of Spanish snuff. The wine being poured upon them, they rise, clarify it, and subside. They are always left with the vender, unless there is an agreement to the contrary. Ten or twelve bottles in quantity are allowed to be kept back by the vender from each cask for this purpose. Casks with the lees sell for four times the price of those without, and hence wines that are adulterated by coloring, or with any other object, do not produce lees, and lose their strength. A small quantity of lees should be thrown into every cask prior to exportation, and when 8 or 10 years old the wine should be bottled. — A sort of wine *liqueur* is made in *C.*, and exported to Syria and the parts adjacent, but little, if any, comes to the West. It is imitated in Paris under the name of *vin de Chypre*, and sold as a *liqueur* in the coffee-houses.

D

D, the abbreviation for pence, from the Latin word *denarius*, a penny. — As a Roman numeral, D represents 500, and, with a dash over it, 5,000.

Dab, a small lump or mass of anything soft or moist, as a dab of butter. — A small flat fish about 8 or 9 inches in length; the *Pleuronectes limanda*.

Dabber, a silk ball, stuffed with wool, used by engravers for spreading the *ground* upon the hot places.

Dabbing-Machine, a machine employed in casting large metal type.

Dabs, refuse foots of sugar.

Dace, a river fish, the *Cyprinus leuciscus*.

Dagger, a weapon with a pointed blade, adapted for stabbing; a poniard.

Daguerreotype. See PHOTOGRAPHY.

Dahlia, a large, showy, and much-esteemed garden flower, of which there are numberless varieties. The common *D.* (*D. variabilis*) appears to be a variable plant in nature, and has received several names supposed to indicate distinct species, but they are now generally united under the above designation. In the wild state the central or disk florets are small, tubular, and yellow, and the mar-

Fig 120. — DAHLIA.

ginal or ray florets only conspicuous and highly colored in some shade of scarlet. But every successive sowing brought forth new variations in color, and gradually the disk-florets were metamorphosed, assuming the same shape and color as the outer ones, until at length the "perfect flower" of florists was attained, in which all the florets are similar, forming an almost spherical head, erroneously termed a double flower (Fig. 120) The dahlia indeed offers one of the most striking instances of the variability of species under domestication, which is exemplified not only in the modification of the disk-florets but also in the wide range of colors. But so little is understood of the real nature of vegetable coloring matter and the cause of its variability, and to what influences the changes must be ascribed, that we cannot correctly estimate the importance of this phenomenon. We know that pure white flowers exist, and that various shades and tints of yellow, scarlet, and purple, and combinations of these colors, are common; but we are not sure whether these colors are not also found in natural varieties. There is evidently a limit in the production of colors, as nothing approaching blue has been observed in all the varieties raised. Perhaps chemistry may some day tell us why.

Dahlia Dye. The shade of color which is commonly termed *D.* is a reddish lilac. It is produced by combining a blue or purple with red when a compound color is used. Upon wool and silk it can be obtained directly by means of archil or cudbear, either alone or "blued" by a small quantity of sulphate of indigo. Upon cotton indifferent shades of *D.* are obtained by macerating in sumac liquor, working in tin solution, and dyeing in logwood mixed with some red wood.

Daiker, a measure of certain commodities by number, usually 10, but sometimes 20; as, by the English statutes, a daiker of hides is 10 skins, a daiker of gloves is 20 gloves, or 10 pairs. It is also sometimes employed as the 10th part of the long hundred, in which case it is 12.

Dainty, a delicacy; in Scotland the term is applied to anything large or fine.

Dairy Milk, either in its natural state, or in the form of butter and cheese, is an article of diet so useful, wholesome, and palatable, that dairy management, which includes all that concerns its production and treatment, constitutes a most important branch of husbandry, given separately in this work under the headings, MILK, BUTTER, and CHEESE.

Dairy-Farm, a farm chiefly devoted to meadow and pasture.

Dakota, a territory of the U. States, bounded on the N. by the Dominion of Canada, E. by Minnesota and a small part of Iowa, S. by Nebraska, and W. by Montana and Wyoming. It is situated between 42° 28′ and 49° N. lat., and 96° 20′ and 104° W. lon., — thus extending about 400 m. from E. to W., and about as much from N. to S. with an area estimated at 150,932 sq. m. With the exception of a small portion drained by the Red River and the Minnesota, D. belongs to the basin of the Missouri, which enters at the N. W. corner, as a navigable river, and proceeds with considerable meandering for upwards of 1,000 m. in a S. E. direction across the Territory, receiving from the right the Little Missouri, the Big Knife, the Cannon Ball, the Grand River, the Owl, the Big Sheyenne, the Bad River, and the White River, and from the left, besides a large number of small tributaries, one considerable affluent known as the James or Dakota River, which traverses nearly the whole length of the Territory with a predominant southern direction, and joins the larger stream at the S. E. corner. There are no mountains of any importance in the Territory except the Black Hills on the western frontiers, which attain a height of 6,700 feet; but a plateau called the Co-

teau des Prairies, with a mean elevation of 1,450 feet above the level of the sea, occupies a considerable area on the eastern borders, and another known as the Coteau du Missouri stretches south between the Missouri and the Dakota. A large district in the southwest between the White River and one of the main branches of the Big Sheyenne bears the descriptive designation of the Mauvaises Terres. In the Coteau des Prairies and several other parts of the Territory there are a large number of lakes, the most extensive of which is the Minniwakan or Devil's Lake, a sheet of salt water 40 m. long by about 12 m. in breadth. *D.* has hitherto been only partially explored, but the military expedition of 1874, under the command of General Custer, reports very favorably of the soil and climate of the virgin districts. A large part of the surface consists of open prairie-land finely adapted for the raising of stock, and most of the river-valleys appear suitable for the plough. The experience of the settlers shows that Indian corn, wheat, barley, oats, and potatoes, as well as apples, plums, grapes, and hops, can be successfully cultivated. The hills are covered with timber, mostly pine and spruce; while the banks of the rivers are in many places bordered with ash, elm, poplar, maple, and other trees. The mineral wealth of the region includes deposits of iron ore, extensive beds of limestone, gypsum, and sandstone, and a certain amount of plumbago and gold. Coal, lead, and petroleum have also been discovered. Buffaloes, bears, antelopes, and elks are still abundant in the remoter districts; and the beaver still builds his dam in many of the streams. The population of Dakota is mainly aboriginal, — the principal tribes being the Sioux in the south, who number about 26,000, and the Arickarees, the Gros-Ventres, and the Mandans in the northwest. The chief settlement of the whites, Yankton on the Missouri, the cap. of the Territory, had in 1870 a population of 737; and the whole amount of land under cultivation at the same date was 42,645 acres. The Northern Pacific railroad passes through the Territory from east to west, entering at Fargo, on the Red River, crossing the Missouri at Burleigh City, and proceeding onwards to cut the Yellowstone River at Wolf Rapids at Montana. White pop. in 1870, 14,181.

Dakota Southern R.R. runs from Sioux City, Iowa, to Yankton, Dak., 61.50 m. This Co., whose offices are in Sioux City, was chartered in 1871 and opened in 1873. It also runs the Sioux City & Pembina R.R. *Financial statement:* Cap. stock, $1,500,000. Funded debt, 1st mortgage 7 % 20-year gold bonds, payable Feb., 1894, $558,000. Net earnings for 1878, $101,138.73.

Dali, Dari, a large and majestic tree growing in Demerara, the *Virola sebifera;* the wood is light, and splits freely, and is used for staves and headings of casks. From the seeds candles equal to those of wax are made.

Dalmes, a name in Scotland for damask cloth.

Dam, a wall or mole built across a river, to confine or elevate the water for irrigation purposes, or for impelling mill-wheels, etc.; the mother, as applied to beasts or inferior animals.

Dam, Daum, an Indian copper coin, the fortieth part of a rupee, and therefore worth rather more than a halfpenny.

Damage, in law, mischief done by collision, etc.; any injury inflicted or sustained.

Damaged Goods, in the language of customs, are goods, subject to duties, that have received some injury either in the voyage home or in the bonded warehouse. See APPRAISEMENT, § 10.

Damages, the recompense awarded by a jury to a plaintiff, in certain forms of action, for the loss or damage he has sustained by the injury committed by the defendant.

The assessment of *D.* is peculiarly the business of the jury, and the court will only interfere with their decision on strong cause being shown. Thus a verdict may be set aside on the ground that *D.* are excessive, or that they are palpably insufficient. And if it appear that the result was arrived at by mere hazard, as, for instance, by each juryman naming a sum and an average being struck, that would be an impropriety which would invalidate the verdict. There are, moreover, certain principles according to which the *D.* must be ascertained. — To take, first, cases of breach of contract. Here, it is said, the motive of the defendant is an irrelevant consideration. He has broken his contract, and all that has to be done is to fix the amount of the loss occasioned thereby. So wherever there has been a breach of contract, some *D.*, though they should be merely nominal, are recoverable. And when the contract was for a payment of a fixed sum of money, the *D.* recoverable for a breach thereof would be that sum with interest. Where, in other cases, the parties themselves have fixed the sum which should be due as *D.* in case of the contract not being fulfilled, such sum will be the proper *D.* to be awarded by a jury. On this point, however, the cases run rather fine. When a contract provides that a fixed sum shall be payable for breach, the law will ask whether it has been fixed as a *penalty* or as *liquidated* (*i. e.* ascertained) *D.* In the former case it will not allow the fixed sum to be awarded, but will require evidence to show what the amount of loss actually was. On the other hand, when the damage caused by a breach of contract is of its own nature uncertain, and the parties have positively fixed a sum as liquidating *D.*, that sum will be the proper *D.* Where no such arrangement is made, the general rule for the assessment of *D.* is that the aggrieved party is to be placed in the same position, so far as money can do it, as if the contract had been performed. Thus, in a contract for the sale of goods when the vendor makes default in delivery, the proper measure of *D.* is the difference between the contract price and the market price of the goods on the day when they ought to have been delivered; so that if the price has not risen in the interval, the vendee can only get nominal *D.* If he has in the mean time resold the goods to a sub-vendee, he cannot claim against his own vendor any *D.* which the sub-vendee may recover against him for breach of contract, because he ought to have gone into the market and purchased other goods. Again, if a buyer refuses to accept the goods when tendered to him, the measure of *D.* will be the difference between the contract price and the market price at the time of his refusal, if the latter is lower than the former. But in such cases the trouble and expense of finding a new purchaser or other goods may be taken account of in assessing the *D.* It has been held that in a breach of contract to replace stock lent, the measure of *D.* will be the price of the stock on the day when it ought to have been delivered or on the day of trial, at the plaintiff's option. Where goods inferior in quality to those contracted for are delivered, the difference between the value at the time of delivery of the goods contracted for and the value of those actually delivered will be the proper *D.* The controlling principle, in fact, is that compensation should be determined by the amount of the actual loss. In a case where a person had agreed

with a boarding-house keeper for a year, and quitted the house within the time, it was held that the measure of *D.* was not the price stipulated to be paid, but only the loss caused by the breach of contract. In contracts to marry, a special class of considerations is recognized, and the jury in assessing *D.* will take notice of the conduct of the parties. The social position and means of the defendant may be given in evidence to show what the plaintiff has lost by the breach of contract. — It is not every loss caused by the act or default complained of which can be taken in estimating the proper amount of *D.* The remoteness of the consequences is a bar to their being recognized in the assessment, and it is a question of no little difficulty what *D.* are and what are not excluded for remoteness. So also in cases of trust, the general rule is that the *D.* must be restricted to the "legal and natural consequences of the wrongful act imputed to the defendant." In an action by the proprietor of a theatre, it was alleged that the defendant had written a libel on one of the plaintiff's singers whereby she was deterred from appearing on the stage, and the plaintiff lost his profits; such loss was held to be too remote to be the ground of an action for *D.* The great difficulty of framing a rule which shall meet all cases is acknowledged by judges and legal writers. One judge declared that no rule could be made in the matter. Another declared that the rule in the majority of cases could have no application, because parties never contemplate the consequences of a breach of contract. The cases probably do not go beyond this, that, when from facts known to everybody, or from special facts proved to be known to the defendant, he ought to have anticipated the consequences of the breach of contract, he will be liable for them. — The rule that the contract furnishes the measure of the damages does not prevail in the case of unconscionable, *i. e.* unreasonable, absurd, or impossible contracts. The old school-book juggle in geometrical progression has more than once been before the courts as the ground of an action. Thus when a man agreed to pay for a horse a barleycorn per nail, doubling it every nail, and the amount calculated as 32 nails, was 500 quarters of barley, the judge directed the jury to disregard the contract, and give as damages the value of the horse. And when a defendant had agreed for $5 to give the plaintiff two grains of rye on Monday, four on the next Monday, and so on, doubling it every Monday, it was contended that the contract was impossible, as all the rye in the world would not suffice for it; but one of the judges said that, though foolish, it would hold in law, and the defendant ought to pay something for his folly. And when a man had promised $5,000 to the plaintiff if he should find his owl, the jury were directed to mitigate the damages. — In American law, interest is in the discretion of the court, and is made to depend on the equity of the case. In both England and America compound interest, or interest on interest, appears to have been regarded with the horror that formerly attached to usury. American lawyers generally hold that compound interest cannot be taken except upon a special agreement made after the simple interest has become due. (See INTEREST.) — In actions of tort the discretion of the jury is not so strictly limited as in cases of breach of contract. In estimating the damages for a civil injury, matter of aggravation may be taken into account. The right of the jury to give exemplary or vindictive damages has been repeatedly confirmed in recent cases by the United States courts. — When both parties are in fault, if the plaintiff's conduct has contributed to the injuries, his claim for damages will not be sustained. This has been carried so far that it has been held that, when a person in one carriage receives injuries from the management of another carriage, he cannot recover damages if any negligence, either on his own part or on the part of the owner or managers of the carriage in which he was, has contributed to the accident. In the Courts of Admiralty, where the question constantly arises in cases of collision, a different rule has been adopted. When both vessels are in fault the whole amount of loss is divided between them. *D.* are said to be either *general* or *special.* The former are given for losses implied by law as the necessary consequences of the wrongful act. The latter are not implied by law, but are compensation for such loss as may be proved to have been in fact caused by the wrongful act. Thus, in an ordinary slander, special damage must be alleged and proved to entitle the plaintiff to pecuniary compensation. But if a slander touches a person in the way of his trade, the law will presume that it caused loss to the plaintiff, without calling on him to show what the loss actually was. Loss caused by an act which is not wrongful (*damnum absque injuria*) cannot be the ground of an action for *D.*; for instance, if A's business is injured by his neighbor B starting the same business, this is not an actionable loss. — *For Damages on Protested Bills of Exchange in the Several States, see Table under* DAYS OF GRACE.

Damask, a technical term applied to several distinct manufactures or manufacturing operations, from the fact that such products or operations were intimately connected with Damascus when that Syrian city was a great manufacturing centre. The principal application of the term is to variegated textile manufactures; and at the present day it generally indicates a twilled linen texture richly figured in the weaving with flowers, fruits, or ornamental scrolls, or with large designs of any description. The texture to which the name, however, was originally applied was of silk, with patterns elaborately woven in colors and sometimes in gold thread. — Linen *D.*, which are employed principally for table-cloths, napkins, and towels, are manufactured at Dunfermline, Kirkcaldy, and some other places in Fifeshire, Scotland; at Lisburn and Belfast, in Ireland; and in Holland, Belgium, and Russia. The fabric is usually woven in from four to eight leaf twills, that is, with the weft intersecting the warp from every fourth up to every eighth thread; and the pattern is produced by varying the intersections on principles which will be explained under WEAVING. Cotton *D.*, in imitation of the linen manufactures, are now much woven and used for toilet covers and for similar purposes. Colors are frequently introduced in cotton *D.*, manufactured in Glasgow and Paisley for dress purposes, and sent to the Indian and West Indian market. Silk *D.* are manufactured for curtains and for other upholstery uses in all the great silk-weaving centres. *Imp.* duty is given under SILK, LINEN, and COTTON.

Damaskeening, or **Damascening**, is the art of incrusting wire of gold (and sometimes of silver) on the surface of iron, steel, or bronze. The surface upon which the pattern is to be traced is finely undercut with a sharp instrument, and the gold thread by hammering is forced into and securely held by the minute furrows of the cut surface. This system of ornamentation is peculiarly Oriental, having been much practised by the early gold-

smiths of Damascus. It is still eminently characteristic of Persian metal-work.

Damask Steel, or **Damascus Steel**, has a peculiar watered or streaked appearance, as seen in the blades of fine swords and other weapons of Oriental manufacture. Several methods of producing the damask grain may be pursued successfully, one of which is described under CUTLERY. The art of producing damask steel has been generally practised in Oriental countries from a remote period, the most famous blades having come from Ispahan, Khorasan, and Shiraz in Persia. With great brightness and ductility the metal combines peculiar elasticity, and a capacity for taking and retaining a very fine edge.

Damassin, a name for silk damask containing gold or silver flowers in the fabric.

Dammar, or **Dammer**, a resin of the copal kind, obtained from *Dammara orientalis*, a huge pine-tree, which grows in Java, Sumatra, Borneo, and other Eastern islands. As found in commerce it is a hard, transparent, brittle, straw-colored resin, destitute of odor. It is readily soluble in ether, benzole, and chloroform, and with oil of turpentine it forms a fine transparent varnish which dries clear, smooth, and hard. The *Kaurie gum* or *D.* of New Zealand is closely allied both in source and properties, being produced by *Dammara Australis* (Fig. 121). *D.* is, besides, a generic Indian name for various other resins, which differ little from the above in physical properties, and are scarcely known in Western commerce. *Imp.* free.

Fig. 121.—DAMMAR OF NEW ZEALAND.

Damp, a mining name for noxious and explosive gases, the choke-damp being carbonic acid, and the fire-damp carburetted hydrogen.

Damper. The *D.* of a furnace or fireplace is a door or valve, which, by rising, falling, sliding, or otherwise, lessens the passage for air, and thus damps or checks the intensity of the combustion. — The *D.* of a piano-forte also acts as a check; it is in the form of a small level, which presses against a string soon after it has begun to sound, and thus stops the vibration. An apparatus which communicates dampness is also called a *D.*; thus damping-machines have been invented for the purpose of moistening postage and other stamps.

Damson, a species of small black plum, much used in the preparation of tarts, etc. *D.* are rather apt to disagree with delicate stomachs, and also to affect the bowels. See PLUM.

Damson-Cheese, a conserve of dried damsons pressed into a cake.

Dan, a kind of small truck or sledge used in coal-mines.

Dandelion, the *Taraxacum dens-leonis*, a perennial composite herb, found in all parts of the world. Its root is employed in medicine, being diuretic and tonic. It is roasted and used as coffee, and when mixed with an equal weight of foreign coffee constitutes the article once so much puffed under the name of *D.-coffee*. A similar mixture prepared with chocolate forms the *D.-chocolate* of the shops. The blanched leaves are used in salads, and the inspissated juice, extract, and decoction are employed in medicine, and are considered as detergent, aperitive, and deobstruent. *Imp.* duty, 3 cts. per lb.

Dandy, a sloop or cutter with a jigger-mast abaft, on which a mizzen lug-sail is set.

Dandy-Brush, a hard whalebone bristle brush.

Dandy-Horse, a velocipede.

Dandy-Roller, a woven wire sieve for a paper-mill.

Danes, a cotton fabric for handkerchiefs made at Manchester, in lengths of ten handkerchiefs and 27 inches wide; the varieties are Glasgow, Antippo, and light glazed Danes.

Dangerous Goods, in the merchant shipping law, are easily inflammable or explosive goods which are only permitted to be placed on board vessels under certain restrictions.

Revised Statutes of the U. States, Sect. 4288. "Any person shipping oil of vitriol, unslaked lime, inflammable matches, or gunpowder, in a vessel taking cargo for divers persons or freight, without delivering at the time of shipment, a note in writing, expressing the nature and character of such merchandise, to the master, mate, officer, or person in charge of the lading of the vessel, shall be liable to the U. States in a penalty of $1000. But this section shall not apply to any vessel of any description whatsoever used in rivers or inland navigation." See NITRO-GLYCERINE.

Dangers of the Sea, a phrase which occurs in a bill of lading, the master agreeing to deliver the goods therein mentioned to the consignee in like good order, "the dangers of the sea excepted." The phrase is understood to include only losses arising from some irresistible force, or which are of an extraordinary nature, and cannot be guarded against by the ordinary exertions of seamen, skill, and prudence. Thus, in case of shipwreck or loss or damage by reason of stress of weather, or other unavoidable cause incident to the voyage, the owners of the goods must resort to the underwriters, and not to the captain or owner of the vessel, to make good their loss. But loss or damage from a storm at sea, arising from a lack of skill on the part of the captain, or for want of good seamanship, will not exonerate the vessel. — *T. McElrath.*

Dannemora Iron. See OREGROUND IRON.

Dant, a heavy metal weight with a ring handle, used for beating down the layers of salted provisions in casks. The dant for pork casks weighs about 32 lbs., that for beef 40 lbs.

Danter, a person engaged in silk-throwing operations.

Dantzic. See GERMANY.

Danube [Ger. *Donau*; Hungarian, *Duna*], an important river, and, next to the Volga, the largest in Europe, traversing the southern part of Germany, Austria, Hungary, and the northern part of Turkey, and falling into the Black Sea, after a course of about 1,750 (or, including its windings, 2,000) miles. Its basin, which comprises a territory of nearly 300,000 sq. m., is bounded by the Black Forest, some of the minor Alpine ranges, the Bohemian Forest, and the Carpathian Mountains on the north, and by the Alps and the range of the Balkan on the south. The *D.* is generally considered to be formed by the union, at Donaueschingen, of the Brigach and the Brege, two mountain streams from the Black Forest; though a third stream, originating in a spring in the palace garden of Donaueschingen, at a height of about 2,850 feet above the sea, is by some held to be the true source. After pass-

ing N. E. through the kingdom of Würtemberg and part of Bavaria to Ratisbon, it turns to the S. E., and maintains that direction till it approaches Lintz in Austria. From this town its course is in the main easterly to Hungary, which it enters a little above Presburg From Presburg it flows S. E. through the lesser Hungarian plain to its confluence with the Raab, whence it runs E. to Waitzen. At Waitzen it turns S., and flows with a slow current and numerous windings through the greater plain of Hungary for nearly 2½ degrees of latitude. After its junction with the Drave it again takes a general S. E. direction to Orsova, where it leaves the Austrian territories by the famous pass of the Iron Gate, with once formidable rapids. From Orsova, its course is generally S. by E. to Kalafat, thence mostly E. by S. to Sistova; it there takes an E. by N. direction to Rassova, then turns N. to Galatz, and finally eastward to the Black Sea. Among its 400 tributaries, of which upwards of 100 are navigable, the principal are, — on the right, the Iller, Lech, Iser, Inn, Ens, Raab, Drave, Save, Morava, Timok, Isker, Vid, and Jantra; and on the left, the Altmühl, Nab, Regen, March, Waag, Gran, Theiss, Temes, Chyl, Aluta, Jalomnitza, Sereth, and Pruth. The *D.* communicates with the Rhine by means of the Ludwigs-Canal, which unites the Altmühl with the Main, with the Elbe by means of the Moldau and other canals, and with the Theiss, its own tributary, by means of the Franzens-Canal. At Ulm the *D.* receives the Iller, and thus, at a height of 1,400 feet above the sea, becomes navigable for flat-bottomed boats of 100 tons. From Donauwörth to Passau it traverses the Bavarian plain, leaving which it intersects a mountainous region till it reaches Vienna. At Passau it is 800 feet above the level of the sea, and at Vienna 450. From Vienna to the mouth of the Drave it flows through an expanse of plain country, broken only in a few places, as at Presburg, Buda, and Waitzen. At Isakcha the channel is 1,700 feet broad and 50 feet deep. At extreme low water the total current is 70,000 cubic feet per second, at ordinary low water 125,000, at ordinary high water 324,000, and during extraordinary flood, 1,000,000, and thus, on a general average, from the observations of 10 years, 207,000 feet per second. About 15 m. below Isakcha the river breaks up into two branches, of which the northern or Kilia branch forms an irregular network of channels on its way to the sea, and after reuniting into one, gives rise to a secondary delta with nine or ten arms; while the southern or Tultcha branch subdivides before long into the central or Sulina branch and the southernmost or St. George's. The delta thus formed comprises an area of about 1,000 sq. m., almost totally destitute of cultivation, and broken in all directions by swamps and fresh-water lakes. In terms of the Peace of Paris, March, 1856, the river not only was placed under the protection of international law, and declared free to the ships of all nations, but a commission was constituted in November of that year for the purpose of putting the deltaic portion in the best possible state for navigation. It took the title of "European Commission of the *D.*" After a discussion which lasted from December, 1857, to April, 1858, the delegates could not come to an agreement in regard to the relative claims of the St. George's and the Sulina mouths, and had to refer the question to their respective governments. A technical commission appointed by France, England, Prussia, and Sardinia decided unanimously in favor of St. George's, but recommended, instead of the embankment of the natural channel, the formation of an artificial canal closed by sluices at its junction with the river, and reaching the sea at some distance from the natural embouchure. The choice of St. George's made by this commission was adopted at Galatz in December, 1858, and six of the seven representatives voted for the canalization; but, owing to various political and commercial considerations, it was ultimately decided to do nothing more in the mean time than render permanent and effective the provisional works already commenced at the Sulina mouth. These consisted of two piers, forming a seaward prolongation of the fluvial channel, and had been commenced in 1858, according to Sir Charles Hartley's plan calculated for a period of six or eight years. In their permanent form they were completed on the 31st July, 1861, having required for their construction 200,000 tons of stone, and 12,500 piles. The northern pier had a length of 4,631 feet, the southern of 3,000, and the depth of water in which they were built varied from 6 feet to 20 feet. At the commencement of the works the depth of the channel was only 9 feet, but by their completion it had increased to 19 feet. Ten years afterwards it was found expedient to make the total length of the piers 5,332 and 3,457 feet. Various minor rectifications of the channel were also effected, and in 1865 a lighthouse was established in 44° 51′ N. lat. and 29° 36′ 32″ E. lon. Of what value the works of Sulina have proved may be shown by the fact that of 2,928 vessels navigating the lower *D.* in 1855, 36 were shipwrecked, while of 2,676 in 1865 only 7 were thus unfortunate. By the treaty of March 13, 1871, signed at London by the seven powers, the commission is to exist for twelve years, and the works accomplished under its superintendence are declared permanently neutral. It is independent of the Roumanian Government, and has various sovereign powers over the *D.* below Isakcha, such as the control of the police, the collection of taxes, and the disposal of its revenue. The same treaty authorizes the permanent commission of riparian states (Austria, Bavaria, Würtemberg, Turkey, Moldavia, Wallachia, and Servia), which commenced its labors at Vienna in 1856, to collect a tax from all the vessels navigating the river, in order to pay the expenses of the proposed removal of the obstructions that still render dangerous the passage of the Iron Gate.

Dardanelles [Turkish, *Bahr-sefid Boghasi*], the strait forming the communication between the Sea of Marmora and the Archipelago. Its shores are formed by the peninsula of Gallipoli on the N. W., and by the mainland of Asia Minor on the S. E.; and it extends for a distance of about 47 m., with an average breadth of 3 or 4 m. For details on the currents of the *D.* see BLACK SEA, in the *Appendix.* In terms of the Paris Peace of 1856, merchant vessels are only allowed to pass the defending castle of Chanka-Kalesi during the day.

Darger, a day-laborer in Scotland.

Darmstadt. See HESSE-DARMSTADT.

Darning-Needle, a long needle for mending holes or rents.

Darsena, a Spanish name for a place in a harbor for laying up and repairing ships.

Dash, a flourish in writing. — A bold effort. — In Scotland, a cant term for a hat or cap. — On the W. coast of Africa, a present made by traders to headmen or native chiefs.

Date, that part of a writing or letter which expresses the day of the month and year in which it was written.

Date-Palm. The dates of commerce are the fruit of a species of palm, *Phœnix dactylifera* (Fig. 122), a tree which ranges from the Canary Islands through N. Africa and the S. E. of Asia to India. It has been cultivated and much prized throughout most of these regions from the remotest antiquity. In Arabia, indeed, it is the chief source of national wealth, and its fruit forms the staple article of food in that country. The tree has also been introduced along the Mediterranean shores of Europe; but as its fruit does not ripen so far north, the European plants are only used to supply leaves for the festival of Palm Sunday among Christians, and for the celebration of the Passover by Jews. The date-palm is a beautiful tree, growing to a height of from 60 to 80 feet, and its stem, which is strongly marked with old leaf-scars, terminates in a crown of graceful shining pinnatisect leaves.

Fig. 122. — Date-Palm.

The flowers spring in branching spadices from the axils of the leaves, and as the trees are unisexual, it is necessary in cultivation to fertilize the female flowers by artificial means. The fruit is an oblong drupe, which varies as much in size, color, and quality, under cultivation, as does the apple in temperate regions, while the recognized and named varieties of the one fruit are quite as numerous as those of the other. Regarding this fruit Mr. W. G. Palgrave (*Central and Eastern Arabia*) remarks: "Those who, like most Europeans at home, only know the date from the dried specimens of that fruit shown beneath a label in shop-windows, can hardly imagine how delicious it is when eaten fresh and in Central Arabia. Nor is it, when newly gathered, heating, — a defect inherent to the preserved fruit everywhere; nor does its richness, however great, bring satiety; in short, it is an article of food alike pleasant and healthy." In the oases of Sahara, and in other parts of N. Africa, dates are pounded and pressed into a cake for food; and it is said that there the fruit is the food of man and beast, and is eaten by horses and camels, and even by dogs. The dried fruit used for dessert in European countries contains more than half its weight of sugar, about 6 per cent of albumen, and 12 per cent of gummy matter. All parts of the date-palm yield valuable economic products. Its trunk furnishes timber for house-building and furniture; the leaves supply thatch; their footstalks are used as fuel, and also yield a fibre from which cordage is spun.

Date sugar is a valuable commercial product of the East Indies obtained from the sap or toddy of *Elate sylvestris*, a tree so closely allied to the date-palm that it has been supposed to be the parent stock of all the cultivated varieties. The juice, when not boiled down to form sugar, is either drunk fresh, or fermented and distilled to form arrack. The uses of the other parts and products of this tree are the same as those of the date-palm products. *Date-palm meal* is obtained from a small species, *Elate farinifera*, growing in the hill country of Southern India; it is occasionally resorted to in times of distress or famine.

Datum-Line, a given level or base from which to calculate elevations, etc. In the construction of a plan, as of a railway or canal, the surface points are reckoned or measured from the datum level.

Datura. See Thorn-Apple.

Daub, a smear, or rough covering of paint or plaster.

Daucus, a name for Cretan birds'-nests imported into Spain.

Daugh, in Scotland, a division of land, capable of producing 48 bolls of grain; sometimes written Dawache.

Daum, an imaginary Indian money, the fortieth part of a rupee, which is 2*s*.

Daundee (Hindustani), a waterman.

Davenport, a piece of furniture in which to keep music-books, etc.

Davenport and Northwestern R.R. runs from Davenport, Ia., to Fayette, Ia., 128.40 m., with branch from Eldridge to Maynoketa, Ia., 32.25 m., total 160.65 m. This Co., whose offices are in Davenport, Ia., was formed by the reorganization of the Davenport and St. Paul's R.R. Co., which was sold under foreclosure in 1876. *Financial statement:* Cap. stock, $3,520,000. Funded debt, 1st mortgage, 5 % 30-year bonds, payable 1 Dec. 1906, $1,710,000. Net earnings for 1878, $17,738.

Davit, a projecting wooden crane at the bow of a ship for hoisting the flukes of the anchor to the gunwales; davits are also pieces of timber or iron protruding over a ship's side or stern, having sheaves or blocks to hoist a boat up to.

Davit-fall Hook, a hook having a means for instant unclutching or release, and used at the end of a davit-fall to engage a ring-bolt at the stem or stern of a boat.

Davy-Lamp. See Fire-Damp.

Day, the light of a window in a bay; the distance between mullions.

Day-Book. See Book-Keeping.

Days of Grace, the period of three days allowed by law or custom beyond the fixed day of payment to meet an acceptance or note, unless "without grace" is expressed on the paper. The Laws of Grace on Sight Drafts and Damages on Protested Bills of Exchange in the U. States are as follows: —

States.	Laws of Grace on sight drafts	Damages for Protested Bills. Domestic.	Foreign.
Alabama	Grace by custom	5	10
Arizona	No grace	15	20
Arkansas	No statute	2 @ 6	10
California	No grace	15	20
Colorado	"	10	10
Connecticut	"	2 @ 8	*
Dakota	Grace by Statute 1873	2	3, 5, 10
Delaware	No grace	20	*
Florida	" *	5	5
Georgia	" § 2784, Code	5	10
Idaho	"	15	30
Illinois	"	....	....
Indiana	Grace is allowed.	5	10
Iowa	"	3 @ 5	5
Kansas	No grace (act Mar 1, 1870)	6	6
Kentucky	Grace is allowed	*	none
Louisiana	No grace	5	10
Maine	Grace by statute	3 @ 9	*
Maryland	No grace	8	15
Massachusetts	Grace is allowed	1 @ 5	20
Michigan	Grace by custom	5 @ 10	*
Minnesota	"	5	10
Mississippi	"	*	*
Missouri	No grace	4 @ 10	20
Montana	Grace by custom*	....	....
Nebraska	Grace by statute	6	12
Nevada	No grace	15	20
New Hampshire	Grace by statute	*	*
New Jersey	"	*	*
New Mexico	No grace	6	6
New York State	" (act of Apr , 1857)	3 @ 10	10
North Carolina	Grace by act Jan , 1847	3 @ 10	15 @ 20
Ohio	No grace (act Feb , 1861)	*	*
Oregon	Grace by statute	5	10
Pennsylvania	No grace (act May, 1857)	5 @ 10	10 @ 20
Rhode Island	Grace by act Apr 20, 1876	5	10
South Carolina	" 1848	10	12½ @ 15
Tennessee	No grace by statute	3	15 @ 20
Texas	Grace by statute	*	10
Utah	Grace by custom	*	*
Vermont	No grace	*	*
Virginia	"	3	10
Washington	"	....	....
West Virginia	"	....	....
Wisconsin	Grace by statute	5 @ 10	5
Wyoming	Grace by custom	12	12
Canada	"	U S 4	10

* No statute in force.

Dayton and Michigan R.R. runs from Dayton to Toledo, Ohio, 140.71 m. This Co., whose offices are in Cincinnati, was chartered in 1851, and the road was opened in 1862. It was leased in 1863 to the Cincinnati, Hamilton, and Dayton R.R. Co. *Financial statement:* Cap. stock, common, $2,401,527.74; preferred, $1,280,100; funded debt, $2,728,800; lessees, $523,740 31.

D-Block, a block bolted to the ship's side in the channels, to reeve the lifts through.

De, another name for the Dutch *Vingerhoed* (q. v.).

Dead, *false;* as of imitation doors and windows, put in as architectural devices to balance parts. — *Motionless;* as the *dead*-spindle of a lathe, which does not rotate; a *dead*-lock; the *dead*-centre of a crank. — *Opaque;* as a *dead*-light or shutter over a cabin window. — *Solid, without light or opening;* as a *dead-wall*, a *dead-plate*, or unperforated portion of a furnace-grate; the *dead-wood* of a ship. — *Useless;* as *dead steam*, that is, exhausted; *dead-head*, a *feeding-head* or *sullage-piece; dead-weight.* — *Soundless;* as a *dead floor*, which absorbs the sound. — *Flat;* as a *dead-smooth* file, having the least possible height of teeth.

Dead-beat Escapement. See Escapement.

Dead Color. In painting, a color is said to be dead when it has no gloss upon it. This is generally effected by the use of less oil and more turpentine than in ordinary paints.

Dead coloring is the first layer of colors, consisting usually of some shade of gray. Its design is to receive and preserve the finishing colors; and it is called *dead* because it is not seen when the work is completed.

Dead-Eyes, oblate solid blocks of wood, with a groove and 3 holes bored through them, fixed to the channels of a ship, for reeving the lanyards of the shrouds through.

Dead-Freight. See Freight.

Dead-Lights, strong shutters for the stern lights or cabin windows of a ship in boisterous weather.

Dead-Plate, a flat iron plate, sometimes fitted before the bars of a furnace for the purpose of allowing the bituminous coal to assume the character of coke before it is thrust back upon the fire.

Dead-Reckoning, a nautical computation of a ship's position, by the distance run, according to the log line, in a given time.

Deadly Nightshade. See Belladonna.

Deads, in mining, the earth, or other substances, which enclose the ore, on every side.

Dead-stroke Hammer, a power-hammer which delivers the blow without being affected by the recoil of the shaft on which the ram, or hammer, is stocked.

Dead-Weight, the heaviest part of a ship's cargo, laid at the bottom of the hold to maintain her proper equilibrium and hold of the water.

Dead-Wind, a wind blowing right in the ship's face.

Dead-Wood, blocks of timber laid upon each end of a vessel's keel, where her sheer narrows.

Dead-Wool is wool taken from the skin of the carcass instead of being shorn from the live animal.

Dead-Works, those parts of a ship's hull which appear above water-line, when she is fully laden.

Deal, a plank of fir or pine timber, for carpenters' use, above 7 inches wide, differing from a batten, which must not exceed 7 inches; a whole deal is 12 feet long, 11 inches wide, and 2½ inches thick. When sawed of other sizes, they are reduced to that cubic dimension in computing them. See Timber and Wood.

Dealer, a trader in goods of any kind, the specialty being indicated by the prefix, as tea-dealer, wholesale-dealer, etc.

Déballer [Fr.], to unpack.

Débarquement [Fr.], landing.

Débarquer [Fr.], to unlade.

Debase, to lessen in value by adulteration or inferior admixtures.

Debenture, the certificate given at the customhouse to the exporter of goods, on which a bounty or drawback is allowed, bearing that he has complied with the statutory regulations, and is entitled to such bounty or drawback. See Drawback.

Debentured Goods are goods upon which the drawback has been paid.

Debit, to charge in an account; a sum due for goods sold on credit; also, the balance of an account. — *Debit-side*, in book keeping, is the left-hand page of the ledger.

Débris, a word adopted from the French, signifying rubbish, waste, or refuse.

Debt, that which one person owes to another for goods, or money had, etc. See National Debt.

Debtor, one who owes money or any kind of debt; one who is indebted.

Déca, a term derived from the Greek, signifying 10, and used as a prefix in the French Decimal

system of weights and measures, to express a weight or measure ten times the amount of the unit which follows it, as décagramme, décamètre, etc.

Decachordon, an ancient form of harp, having ten strings.

Decade, a measure of time now applied to a period of 10 years.

Décagramme, a French weight represented by a centilitre of pure water. It is the 100th part of a kilogramme, and is divided into 10 grammes = 100 décigrammes = 1,000 centigrammes = 154.3402 English grains. In Holland it bears the name of lood, and in Venetian Lombardy, gros or grosso.

Décalitre, a French measure of capacity, of 10 litres, or 2.201 gallons, the tenth part of the hectolitre. It is the new French bushel for grain, and velto for liquids. As a dry measure it is rather more than the English peck, viz.: 1.10 peck. In Holland, where the decimal system of measures is adopted, they give the name of schepel (boisseau) to the décalitre, and in the kingdom of Venetian Lombardy they call it a *mina* or *mine*.

Decamalee-Gum, an East Indian gum obtained from the *Gardenia lucida* of Roxburgh.

Décamètre, a French measure of length. The décamètre is 1.9884 English pole. It is the 100th part of the kilomètre, and is divided into 10 metres = 100 décimètres = 1,000 centimètres = 10,000 millimètres = 10.936389 yards.

Decantation, the operation of pouring or drawing off the clear portion of a liquid from the impurities or grosser matter that has subsided. It is

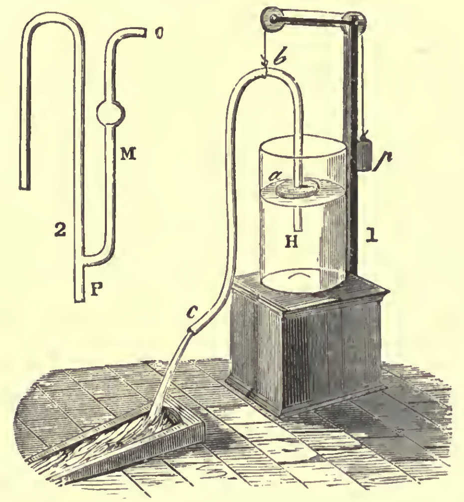


Fig. 123. — Decantation.

commonly performed either by gently inclining the vessel or by the use of a siphon or pump. In the laboratory and the arts it is much resorted to in the purification of precipitates, or other similar operations, where repeated edulcoration or washing is required, for which purpose it is preferable to filtration, from being less troublesome and more economical. In these cases, after a sufficient time having been allowed for the subsidence of the precipitate or powder, or for the clearing of the supernatant fluid, the latter is decanted, and its place supplied by a fresh portion of water, which, after sufficient agitation, is similarly treated, and the whole operation repeated as often as necessary. **1**, in Fig. 123 is the best apparatus for *D.* The siphon is kept in equilibrium by a flat, *a*, and a weight, *p*, so that as the level decreases in the vase, the siphon descends with it; the difference in height between *a b* and *b c* being thus always the same, there is a constant flow. When the pressure in the mouth of the liquid to be decanted would be objectionable, use is made of a siphon (**2**, Fig. 123) to which is soldered a second tube, M, parallel to the longest branch. The siphon is filled by closing the end, P, and sucking at O. See Siphon.

Decanter, a clear glass bottle for holding wine, etc., for the table.

Decarbonization is an operation performed on cast-iron to convert it into soft iron. The articles to be decarbonized are packed in finely powdered hematite, or native oxide of iron, to which iron filings are often added, and exposed for some time to a strong red heat, by which the excess of carbon is abstracted or burnt out. The process somewhat resembles annealing or cementation.

Décare [Fr.], an agrarian or superficial measure, equal to the 10th part of the hectare, and divided into 10 ares. It is never legally used, being considered superfluous, and fully expressed by ares, hectares, and centiares.

Décastere, a French solid measure of 10 stères = 353.1741 cubic feet.

Decennial, occurring every 10 years.

Décharger [Fr.], to unload.

Déchéance [Fr.], a forfeiture.

Déciatine. See Desiatine.

Décigramme, a nominal French weight, the 10th part of the gramme = 1.5434 grains.

Décilitre, a French measure of capacity for liquids, often called a verre, the 10th part of the pint or litre = .704 gill. As a dry measure the décilitre is equal to .176 English pint (6.1028 cubic inches).

Decimal, any number expressed in the scale of tens; a 10th part, multiplied by 10.

Decimal Fractions differ from vulgar fractions in this respect, that their denominators are always 10, or some power of 10, as 100, 1000, etc., and instead of *writing* the denominator under the numerator, it is *expressed* by pointing off from the right of the numerator as many figures as there are ciphers in the denominator; thus, .5, .43, 5.26 denote, respectively, $\frac{5}{10}$, $\frac{43}{100}$, $5\frac{26}{100}$, or $\frac{526}{100}$. The value of each figure in a decimal decreases from the left to the right in a tenfold proportion; that is, each figure is ten times as great as if it were removed one place to the right, as in whole numbers; thus, .5, .05, .005, are $\frac{5}{10}$, $\frac{5}{100}$, $\frac{5}{1000}$, etc., and the decimal .438 is four tenths, three hundredths, and eight thousandths of a unit.

Adding ciphers to the right of a decimal does not alter its value; thus, .5, .50, .500, or $\frac{5}{10}$, $\frac{50}{100}$, $\frac{500}{1000}$, are equal to each other, the numerator and denominator having been multiplied by the same number.

Decimals may be reduced to a common denominator by adding ciphers to the right, where it is necessary, till the number of decimal places is the same in all. Thus, .5, .03, and .564, reduced to a common denominator, are .500, .030, and .564; that is, $\frac{500}{1000}$, $\frac{30}{1000}$, and $\frac{564}{1000}$.

To reduce a vulgar fraction to a decimal, add ciphers at pleasure, as decimals in the numerator, and divide by the denominator, according to the rule for the division of decimals.

Example: $\frac{3}{4} = \frac{3.00}{4} = .75$.

From the very nature of numbers, it must frequently happen that this division may be continued without termination;

but, as the figures always decrease a tenth in value by each remove to the *right* from the point, decimals may be stopped, except in long calculations, at 3 or 4 places, without any great degree of error; and even in continued multiplications, when the decimals are stopped at a given place, we have only to increase the last figure by 1, if the next figure was to be 5 or above it, in order to compensate for cutting them short.

The value of a decimal, of any denomination, is found by multiplying it by the number of parts in the next less denomination, and cutting off as many places to the right hand as there are decimals, and so on until the terms are exhausted. Thus, .634 oz. is =

$$\begin{array}{r l} .634 & \\ 8 & \\ \hline 5.072 & \text{drachms.} \\ 60 & \\ \hline 4.320 & \text{grains.} \\ \hline \end{array}$$

or, 5 dr. 4⅓ gr. (nearly).

The value of a decimal of any foreign money in terms of a lower denomination is found by the same rule. Example: Required the value of £0.66875 (being known that there are 20 shillings in a pound sterling, 12 pence in a shilling, and 4 farthings in a penny) =

$$\begin{array}{r l} .66875 & \\ 20 & \\ \hline 13.37500 & \text{shillings.} \\ 12 & \\ \hline 4.500 & \text{pence.} \\ 4 & \\ \hline 2.0 & \text{farthings.} \end{array}$$

Hence, the value required is 13*s*. 4½*d*.

The following table of equations between vulgar and decimal fractions will be found useful in practice: —

TABLE OF DECIMAL EQUIVALENTS.

$\frac{1}{60}$	.0167	$\frac{13}{60}$	2167	$\frac{5}{12}$	.4167	$\frac{37}{60}$	.6167	$\frac{13}{16}$	.8125
$\frac{1}{48}$	.0208	$\frac{7}{32}$	.2187	$\frac{17}{40}$	4250	$\frac{5}{8}$	.6250	$\frac{49}{60}$	.8167
$\frac{1}{40}$	.0250	$\frac{9}{40}$	2250	$\frac{13}{30}$	.4333	$\frac{19}{30}$	.6333	$\frac{33}{40}$	.8250
$\frac{1}{32}$	.0312	$\frac{11}{48}$	2292	$\frac{7}{16}$	.4375	$\frac{31}{48}$	.6458	$\frac{5}{6}$	.8333
$\frac{1}{30}$	.0333	$\frac{7}{30}$	2333	$\frac{9}{20}$	.4500	$\frac{13}{20}$	6500	$\frac{27}{32}$	.8437
$\frac{1}{24}$	.0417	$\frac{1}{4}$	2500	$\frac{11}{24}$	.4583	$\frac{21}{32}$	.6562	$\frac{17}{20}$	.8500
$\frac{1}{20}$	.0500	$\frac{4}{15}$	2667	$\frac{7}{15}$	4667	$\frac{2}{3}$	.6667	$\frac{41}{48}$	.8542
$\frac{1}{16}$	.0625	$\frac{13}{48}$	2708	$\frac{15}{32}$	.4687	$\frac{27}{40}$	.6750	$\frac{13}{15}$	.8667
$\frac{1}{15}$	.0667	$\frac{11}{40}$	.2750	$\frac{19}{40}$	.4750	$\frac{41}{60}$	.6833	$\frac{7}{8}$	.8750
$\frac{3}{40}$	.0750	$\frac{9}{32}$	.2812	$\frac{23}{48}$	4792	$\frac{11}{16}$	6875	$\frac{53}{60}$	.8833
$\frac{1}{12}$	.0833	$\frac{17}{60}$	.2833	$\frac{29}{60}$	4833	$\frac{7}{10}$	.7000	$\frac{43}{48}$	.8958
$\frac{3}{32}$	.0937	$\frac{7}{24}$	2917	$\frac{1}{2}$	5000	$\frac{17}{24}$	.7083	$\frac{9}{10}$	.9000
$\frac{1}{10}$	.1000	$\frac{3}{10}$	.3000	$\frac{31}{60}$	5167	$\frac{43}{60}$	.7167	$\frac{29}{32}$	.9062
$\frac{5}{48}$	.1042	$\frac{5}{16}$	.3125	$\frac{25}{48}$	.5208	$\frac{23}{32}$	.7187	$\frac{11}{12}$	.9167
$\frac{7}{60}$	.1167	$\frac{19}{60}$	.3167	$\frac{21}{40}$	.5250	$\frac{29}{40}$	.7250	$\frac{37}{40}$	.9250
$\frac{1}{8}$	.1250	$\frac{13}{40}$	3250	$\frac{17}{32}$	.5312	$\frac{35}{48}$	.7292	$\frac{14}{15}$	9333
$\frac{2}{15}$	.1333	$\frac{1}{3}$	.3333	$\frac{8}{15}$	.5333	$\frac{11}{15}$	7333	$\frac{15}{16}$	.9375
$\frac{7}{48}$	.1458	$\frac{11}{32}$	3437	$\frac{13}{24}$	5417	$\frac{3}{4}$	.7500	$\frac{19}{20}$	.9500
$\frac{3}{20}$	.1500	$\frac{7}{20}$	.3500	$\frac{11}{20}$	.5500	$\frac{23}{30}$	7667	$\frac{23}{24}$	.9583
$\frac{5}{32}$	.1562	$\frac{17}{48}$	3542	$\frac{9}{16}$	5625	$\frac{37}{48}$	.7708	$\frac{29}{30}$	9667
$\frac{1}{6}$	.1667	$\frac{11}{30}$	3667	$\frac{17}{30}$	5667	$\frac{31}{40}$	.7750	$\frac{31}{32}$	.9687
$\frac{7}{40}$	.1750	$\frac{3}{8}$	3750	$\frac{23}{40}$	5750	$\frac{25}{32}$	7812	$\frac{39}{40}$	9750
$\frac{11}{60}$	1833	$\frac{23}{60}$	3833	$\frac{7}{12}$	.5833	$\frac{47}{60}$	.7833	$\frac{47}{48}$	.9792
$\frac{3}{16}$	.1875	$\frac{19}{48}$	.3958	$\frac{19}{32}$	5937	$\frac{19}{24}$	.7917	$\frac{59}{60}$	.9833
$\frac{1}{5}$	.2000	$\frac{2}{5}$	.4000	$\frac{3}{5}$	.6000	$\frac{4}{5}$	.8000	[illegible]	1.
$\frac{5}{24}$	.2083	$\frac{13}{32}$	.4062	$\frac{29}{48}$	.6042				

Decimal Weights and Measures. See WEIGHTS and MEASURES.

Décime, a copper coin and money of account in France of ten centimes, and nearly equal to 2 cents.

Décimètre, a French measure of length, being the tenth part of a mètre = 3.9371 inches.

Décistère, a French solid measure, being the tenth part of a stère = 3.531741 cubic feet.

Deck, the planked flooring of a ship, resting on the beams. *D.* may run from stem to stern, or be but partial. Some fishing-craft have a partial *D.* forming a cuddy. Vessels are classed, for some purposes, by the number of their *D.*; as, *single-decked*, *two-decked*, *three-decked*. In three-decked ships the *D.* above the water-line are known as the *upper* or *spar*, *main*, *middle*, *gun* or *lower*, *D.*; in two-decked ships, the *upper* or *spar*, *main*, and *gun*. *D.*; in frigates and merchant-vessels, the upper and main *D.* The *D.* next below the water-line is the *orlop-D.* in two or three deckers, but is known as the lower *D.* in vessels of the lower grades. The after-part of the *orlop-D.* is the *cockpit*. A passage round the *orlop-D.*, to get at the ship's side for repairs during action, is called the *wing-passage*. On this *D.* are the cabins and berths of officers and men. A complete *D.* over the main-deck is the *spar* or *flush D.* The *forecastle* is the foremost part, and the *quarter-D.* the aftermost part, of the *spar-D.*; the *waist* is the space amidships. A small *D.* at the after end is the *poop* or *round-house*, and usually extends to the mizzen. Above it is the *poop-D.* A similar *D.* at the forward end is called the *topgallant-forecastle*. A transverse *D.* extending across the middle of the vessel is called a *hurricane-D.*, *bridge-D.*, or *bridge*. It is common in steam-vessels, covering the space between the paddle-boxes. Detached buildings on a *D.* are *D.-houses*. The openings in a *D.* are *ladder-ways* or *hatchways*. *'Tween-D.* is the space below the *spar-D.* The coverings of a *hatchway* are *hatches*. The raised ledges around the hatchway are *coamings* in the fore and aft direction, *head-ledges* in the parts athwartships. Glasses inserted in holes made in a deck are called *deck-lights*, and serve to light cabins below. — *E. H. Knight.*

Decker, a ship having a deck or decks; as, a three-*decker*.

Deckle, in paper-making, a thin frame of wood fitting on the shallow mould in which the paper pulp is placed; also the rough or raw edge of paper.

Deck-Passenger, one who goes a short channel journey at a cheaper fare, and has not the privilege of the cabins.

Declaration, a report of entry. — An official affirmation or statement made before a properly authorized officer. — In law, that part of the process or pleadings in which a statement of the plaintiff's complaint against the defendant is set forth.

Declinator, an instrument used in dialling, for taking the declination and inclination of a plane.

Declinometer, an instrument for measuring the variation of the magnetic needle, or the force of terrestrial magnetism in the plane of the horizon.

Decoction, an aqueous solution of the active principles of any substance obtained by boiling; also the process of preparing such solution.

The effect of *D.* in water differs greatly from that of infusion. At the temperature of 212° Fahr., the essential oils and aromatic principles of vegetables are dissipated or decomposed; while by infusion in hot water, in covered vessels, they remain for the most part uninjured. The solvent powers of boiling water are, however, much greater than those of hot water; and many vegetable principles scarcely acted on by the one are freely soluble in the other. This is the case with many of the alkaloids, on which the medicinal virtues of several vegetables depend. On the other hand, the solutions of many substances, though more readily made by boiling, are speedily weakened or rendered inert by ebullition, in consequence of the active principles being either volatilized along with the steam, or oxidized or decomposed by exposure to the atmosphere. This is particularly the case with substances abounding in extractive or astringent matter. When the medicinal properties of vegetables are volatile, or are injured by a strong heat, infusion should be had recourse to, in preference to boiling; but when a solution of the fixed constituents is alone sought, *D.* is preferable. The substances employed for making *D* should be well bruised, or reduced to a very coarse powder, or, if fresh and soft, they should be sliced small. In the former case, any very fine powder or adhering dust should be removed with a sieve, as its presence tends to make the product thick and disagreeable, and also more troublesome to strain. The vessel in which the ebullition is conducted should be furnished with an accurately fitting cover, the better to exclude the air; and the application of the heat should be so conducted that the fluid may be kept simmering, or only gently boiling, as violent boiling is not only quite unnecessary, but absolutely injurious to the quality of the product. In every case the liquor should

be strained whilst hot, but not boiling, and the best method of doing this is to employ a fine hair sieve, or a coarse flannel bag. In general it is found that, as *D.* cool, a sediment is formed, in consequence of the boiling water dissolving a larger portion of vegetable matter than it can retain in solution when cold. This deposit for the most part consists of the active principles of the solution, and, unless when otherwise ordered, should be mingled with the clear liquid by agitation, when the *D.* enters into extemporaneous compositions, or when the dose is taken. The length of time occupied by the ebullition is another point demanding some attention. Long boiling is in no case necessary, and should be avoided, especially in decoctions prepared from aromatic vegetables, or those abounding in extractive.

Decoloration, the blanching or removal of the natural color of any substance. Sirups and many animal, vegetable, and saline solutions are decolored or whitened by agitation with animal charcoal, and subsequent subsidence or filtration. Many fluids rapidly lose their natural color by exposure to light, especially to the direct rays of the sun. In this way castor, nut, poppy, and several other oils are whitened. Fish oils are partially deodorized and decolored by filtration through animal charcoal. Cottons and linens are still commonly bleached by the joint action of light, air, and moisture. The peculiar way in which light produces this effect has never been satisfactorily explained. The *D.* of textile fabrics and solid bodies generally is called *bleaching* (q. v.).

Decomposition, the resolution of compounds into their elements, or the alteration of their chemical composition in such a manner that new products are formed.

Decorator, an ornamenter; one who adorns or paints and embellishes houses.

Decorticate, to peel off the bark.

Decoy, a lure; a cage, snare, or enclosure for catching wild-fowl.

Dédit [*Fr.*], a forfeit; a consideration.

Dedo [*Sp.*], a finger's breadth, the forty-eighth part of a Spanish yard or vara.

Deed, a written or printed legal instrument or agreement between contracting parties, executed under seal. When made by one party only, a *D.* is called a *deed-poll;* when several parties are concerned, an *indenture.*

Deep-sea-Line, a line with a plummet, shot, or other attachment for taking soundings at great depths at sea.

Deer, a general name for ruminating animals of the genus *Cervus* (Fig. 124), which have decidu-

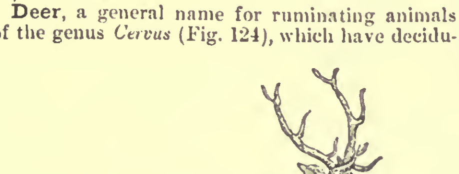


Fig. 124. — DEER.

ous horns or antlers: their flesh is termed venison. Deer's horns enter largely into commerce. The dry skins of different species are imported into this country, chiefly from Central and South America; they come in bales, and are sold by the lb., Para skins being the most esteemed. When tanned, they are called buckskins. See BUCKSKIN.

Defaulter, an officeholder who embezzles public money, or fails to account for money intrusted to his keeping. His offence is called *defalcation.* — Also a trader who fails in his payments, or is unable to meet his engagements.

Defecation, the separation of a liquid from its lees, dregs, or impurities, by subsidence or decantation.

Defect, want or absence of something necessary or useful toward fruition or perfection; fault; flaw; imperfection; a failure or blemish.

Defence, a justification; a legal reply to a plaintiff's declaration.

Defendant, the person accused or summoned, in a court of law, to answer the charges of a plaintiff.

Deficiency Bills, a kind of short loan or advance made to the British government by the Bank of England, whenever the taxes received are insufficient to pay the public dividends due on government stocks.

Deficit, something short or wanting; the deficiency which is discovered in the accounts of an accountant.

Deflagration, the sudden combustion of any substance for the purpose of producing some change in its composition by the joint action of heat and oxygen. The process is commonly performed by projecting into a red-hot crucible, in small portions at a time, a mixture of nitrate of potash and the body to be oxidized.

Defrauder, a cheat; an embezzler; one who wrongs another.

Degree, 60 geographical miles, the 360th part of the circumference of a circle, and the 90th part of a right angle. A degree is subdivided into 60 minutes, and each minute into 60 seconds. The notation employed for an angle of 8 degrees, 14 minutes, and 16 seconds is $8° 14' 16''$. See LATITUDE and LONGITUDE.

Déjeuner, the French word for breakfast.

De Laine. The original French fabric for ladies' dress goods called *mousseline de laine* was, as the name imports, all wool; the English and American de laine are composed of cotton and wool, or worsted. All muslin de laine and all de laine of every kind, except what are called cashmere de laine, are woven perfectly plain, and in the gray or natural colors of the wool, cotton, or hair, and are dyed in the piece by being plunged in the dye; they are also printed in colors, and may be striped or figured. — *T. McElrath.*

Délaissement [*Fr.*], an abandonment.

Delaware, one of the middle U. States, next to Rhode Island the smallest in extent, is situated on the Atlantic seaboard, forming part of the peninsula between the Chesapeake and Delaware Bays. It is bounded N. by Pennsylvania, W. and S. by Maryland, and E. by the Atlantic Ocean and the Delaware Bay and River. Area, 2,120 sq. m. A somewhat elevated table-land passes through a portion of the State from N. to S., dividing the waters which fall into the Chesapeake Bay from those which flow into Delaware Bay. This table-land contains a chain of swamps in the W. part of the State, from which its principal streams originate. The soil in the N. is a strong clay. Along the Delaware River, and for about 20 m. W. of it, the soil is generally a rich clay, well adapted to agriculture; but between this and the swamps the soil is light and sandy. Proceeding southward, the soil becomes more sandy, and in Sussex Co. sand greatly predominates. Kaoline, or porcelain clay, is found in the N., bog-iron ore in the S., and shell-

marl throughout the State. The rivers are small and unimportant. The Delaware and Chesapeake Canal connects the two great bays, and makes an easy water transit for produce between Philadelphia and Baltimore. *D.* is an agricultural state; a part of it is in a high state of cultivation. Besides wheat, Indian corn, and other grain, peaches are grown in immense quantities, and sent over the country; small fruits are also raised for transportation. In the northern parts of the State are numerous manufactories. Wilmington is the principal centre of industry. New Castle, also, has important rolling-mills, and cotton and woollen factories. Dover is the cap. of *D.* The Philadelphia, Wilmington, and Baltimore Railroad runs through the northern part of the State, and the Delaware Railroad goes through the whole length of the peninsula. The Wilmington and Reading Railroad makes a connection with the Pennsylvania coal-region. The debt of the State is $1,224,000, and as the cost of the government is moderate, the taxes are small. Pop. in 1840, 78,085; in 1850, 91,532; in 1860, 112,216; in 1870, 125,015; in 1879 (estimated), 140,000.

Fig. 125 — Seal of Delaware.

Wilmington, the principal commercial town of *D.*, is a port of entry situated in New Castle Co., between Brandywine and Christiana Creeks, 1 m. above their junction. Its manuf. are important, among which are machinery for steamboats, railroad cars, locomotives, mill-machinery, powder, carriages, flour, leather, shoes, cotton and woollen goods, farming implements, etc. On Brandywine Creek are some of the finest flouring-mills in the U. States, to which vessels drawing 8 feet of water can come. Christiana Creek is navigable for vessels drawing 14 feet of water. The tonnage of the port in 1879 was 15,228. During 1878, 6 steamboats, 1 ocean steamer, 2 barks, 11 schooners, and 1 sloop, of an aggregate burden of 9,475 tons, were built. The foreign trade of *D.* is effected chiefly through Baltimore, New York, and Philadelphia, especially the last; so that its direct foreign trade is very inconsiderable, the direct exports for the year 1878 amounting to $28,000, and the imports to $1,750. During the same year 66 vessels, aggregating 17,112 tons, entered the port, and 27 vessels, aggregating 14,019 tons, cleared it. Pop. 35,000.

Delaware R.R. runs from Delaware Junction, Del., to Delmar, Md., 82.83 m., branches 16.68 m., total extent of line, 99.51 m.; this Co., whose offices are in Dover, Del., was chartered in 1849, and the road was leased at its opening in 1860, at a rental of 30% of its gross earnings and an annual dividend of 6%, to the Philadelphia, Wilmington, and Baltimore R.R. Co. *Financial statement:* Cap. stock, $1,450,323.37. Funded debt, $760,600. Net earnings for 1878, 30 %, of receipts, $109,674.04.

Delaware and Bound Brook R.R. runs from Bound Brook, N.J., to Delaware (Pa. line), 27 m.; branch line to Trenton, 3.7 m. This Co., whose offices are in Philadelphia, was chartered in 1874, and the main line was opened in 1876. *Financial statement:* Cap. stock, $1,514,000, funded debt, 1st mortgage 7% 30-year bonds, dated Aug. 2, 1875, $1,500,000, and floating debt, $279,620.66. Total stock, bonds and debts, $3,293,-620.66. Net earnings for 1878, $119,022.32.

Delaware and Chesapeake R R. runs from Clayton, Del., to Oxford, Md., 53.75 m. This Co, whose offices are in Easton, Md., was chartered in 1854 as the Maryland and Delaware R.R. Co., and completed in 1857. The road was sold in 1877, under a decree of foreclosure in favor of 1st mortgage bondholders, for $94,200, bought in for the bondholders, and reorganized under its present title in 1878. *Financial statement* (before sale): Cap. stock, $500,000; funded debt, 1st mortgage 6% bonds, payable 1885, $850,000, and 2d mortgage 6% bonds, $150,000. Total stock and bonds, $1,500,000.

Delaware and Hudson Canal Co. This Co. was chartered in 1823, to construct a canal and R.R. from the coal-fields of Pa. to the Hudson at Rondout, N. Y., and the canal, 108 m., from Honesdale to the latter place, was completed in 1828, and the Gravity R.R. to the coal-fields in 1829. Besides this R.R., in length 62.41 m., the Co. owns the Lackawanna and Susquehanna R.R., running from Nineveh, N. Y., to Jefferson R.R., Pa., 22.01 m., and from Carbondale, Pa., to Scranton, Pa., 16.60 m., total, 38.61 m. It also operates under lease or contract the following lines: Jefferson R.R., from Susquehanna Junction, Pa., to Carbondale, Pa., 34.60 m.; Union R.R., from Greenridge, Pa., to Mill Creek, Pa., 16.69 m.; Plymouth and Wilkesbarre R.R., and branches from Junction, to Plymouth, Pa., 3.22 m.; and under lease on separate account, the Albany and Susquehanna R.R. from Albany to Binghampton, 142.59 m.; the Cherry Valley, Sharon, and Albany R.R., from Cobbleskill to Cherry Valley, 20.91 m.; the Schenectady and Duanesburg R.R., between both named places, 13.84 m.; Rensselaer and Saratoga R.R., from Troy to Whitehall, and branches, 182.62 m.; New York and Canada R.R., from Whitehall to Rouse's Point, and branches, 149.93. Total of all lines owned, leased, and operated, 665.40 m. *Financial statement:* Cap. stock, $20,000,000; bonds, 1884, $3,500,000; ditto, 1891, $5,000,000; ditto, 1877–91, $1,482,000; ditto, 1894, $4,856,000; ditto, 1917, $2,450,000; Loan, 1880, $1,045,000. Net earnings for 1878, $398,218.72.

Delaware, Lackawanna, and Western R.R. runs from Delaware River (N. J. line) to N. Y. State line, 115 m. Branches, Scranton to Northumberland, Pa., 80 m.; Greenville to Winton, Pa., 7.50 m; Junction to Keyser Valley, Pa., 5 m.; total, 92.50 m. This Co., whose offices are in Carlisle, Pa., also leases the following lines in New York State: Cayuga and Susquehanna, from Owego to Cayuga Lake, 34.61 m.; Greene from Greene to Chenango Forks, 8 m.; Oswego and Syracuse, between those places, 34.98 m.; Utica, Chenango, and Susquehanna Valley, from Utica to Greene, 97.75 m.; Valley, from Pa. State line to Binghampton, 11.50 m.; total, 186.84 m. It controls the Syracuse, Binghampton, and New York, from Geddes to Binghampton, 81 m. It operates the Rome and Clinton R.R., between those two places, 12.70 m.; and the Utica, Clinton, and Binghampton R.R., from Utica to Smith's Valley, 31.30 m. It leases the following lines in New Jersey: the Chester R.R., from Dover to Chester, 10 m.; the Morris and Essex, from Hoboken to Phillipsburg and Boonton Bridge, 118.22 m.; the Newark and Bloomfield, from Newark Junction to West Bloomfield, 4.25 m.; and the Warren R R., from Delaware River to Hampton Junction, 18.25 m; total, 150.72 m. Total of all lines owned, leased, and operated, 670.06 m. The Co. was formed in 1853,

by the consolidation of the Lackawanna and Western R.R., and the Delaware and Cobb's Gap R.R. *Financial statement:* Cap. stock, $26,200,000. Funded debt, $5,887,100. Net earnings for 1878, $2,320,481.42.

Delaware River and **Bay**. The *D.* River rises on the W. side of the Catskill Mountains, State of New York, and after separating Pennsylvania from New York and New Jersey, falls into the *D.* Bay 5 m. below New Castle. It is formed by the union of two streams, the Mohawk and the Popacton, which unite 8 m. below the Pennsylvania boundary line, in lat. 42° N. The river then pursues a winding S. E. course between New York and Pennsylvania for 60 m. to the N. W. corner of New Jersey, where it receives the Neversink River. It then turns S. W., along the base of the Kittatninny range, for 35 m., in passing through

Fig. 126 — DELAWARE RIVER.
(*Sherman Waterfall in the Catskill Mountains.*)

which it forms what is called the "water gap," a great natural curiosity. The banks here rise precipitately from the water's edge to the height of 1,600 feet, overhung by immense masses of rock, and at the S. E. entrance leaving scarcely room for a road. The passage, however, widens towards the N.W. Its entire length is about 2 m. From this point it pursues a S. E. and then a S. W. course to Easton, where it receives the Lehigh, a large tributary from the W. A little below this the river passes through South Mountain, and has a S. E. course to Trenton, 60 m. below Easton; having in that distance 25 rapids, with a total fall of 165 feet. These falls are navigable at high water. The river below Trenton turns to the S. W. until near the bay, which it enters in a S. E. direction, after an entire course of 309 m. It is navigable for vessels of the largest class to Philadelphia, 40 m., and for sloops 35 m. farther, to Trenton. Above the falls at Trenton it is navigable for boats of 8 or 9 tons for 100 m. The *D.* is connected with the Hudson River and the bays of New York by the *D.* and Hudson Canal, the Morris Canal, and the *D.* and Raritan Canal. — The *D. Bay* is a large arm of the sea, 75 m. long, 20 m. wide between Cape May on the N. and Cape Henlopen on the S., and 30 m. wide in the middle. The navigation is difficult and dangerous, being interrupted by many shoals. Its low and sandy shores were without harbors until the construction of the *D. Breakwater*, situated at the entrance into *D.* Bay, near Cape Henlopen. The anchorage ground, or roadstead, is formed by a cove in the S. shore, directly W. of the pitch of the cape, and the seaward end of an extensive shoal called *The Shears*. The entrance from the ocean is 1,950 feet in width, and is accessible during all winds from the sea. The depth of water is from 24 to 36 feet deep, at low tide, throughout the harbor. There are two dikes, one of 1,500 feet, and the other of 6,000 feet, giving a secure harbor of seven tenths of a sq. m. The objects of this artificial harbor are to protect vessels from winds from E. to N. W., by way of N. and against the floating ice of the bay.

Del Credere [It., *in trust*], a commercial term seldom used in the U. States, which, in its restricted sense, is an engagement by an insurance broker, for an additional premium, to guarantee the insured against the consequences of the failure of the underwriter. In its ordinary mercantile acceptation it embraces every commercial transaction in which the person who transacts for another engages for the solvency of the person with whom he so bargains. A factor employed to dispose of property, in the usual manner, is only responsible to his principal for the consequence of neglecting that degree of care which a prudent man takes of his own affairs; and if he sell to a person in good credit, and that person fail, he is not responsible for the debt. If the factor or agent, however, hold a *del credere* commission, he engages, in consideration of an additional premium, to guarantee all his transactions. His responsibility extends to the absolute payment, and so it is not sufficient that he remit the price by bills to his principal, — he is responsible for their being honored.

Delineation, a draught, or outline sketch.

Deliquescence, spontaneous liquefaction by absorption of the moisture of the atmosphere. Deliquescent salts are those which by exposure gradually assume the liquid state. They should all be kept in well-closed bottles or jars.

Delivery, the act of transferring the possession of goods from one person into the possession of another. See SALE and STOPPAGE IN TRANSITU.

Delve, to dig, to open the ground with a spade.

Demand, a claim made for a debt due; the asking or requiring of a price for goods offered for sale.

Demand and Supply, these terms, in political economy, express the relation between consump-

tion and production, — between the demand of purchasers and the supply of commodities by those who have them to sell. The relations between the demand for an article and its supply determine its price or exchangeable value: the relations between the demand for labor and its supply determine the amount of wages to be earned by the laborer. For causes explained elsewhere, the price of an article will rarely vary, for any length of time, very much above or below its cost of production; nor will the wages of labor, for any length of time, much exceed or fall below the amount necessary to maintain laborers and their families in such comforts as their habits of life have accustomed them to believe necessary for their subsistence; but, bearing in mind that, in the prices of commodities and labor, there is a certain point, determined by causes independent of demand or supply, above or below which prices cannot materially vary for any considerable time, all variations of price, if the medium in which they are calculated remain unchanged, may be referred to the proportion which exists between the demand for commodities and the supply of them, — between the quantities which purchasers are willing and able to buy, and the quantities which producers are able and willing to sell. The first effect of a demand exceeding the supply of a commodity, is to raise its price. As more persons want to buy the commodity than the producers are able or willing to supply, they cannot all obtain what they desire, but must share the supply between them in some manner. But their wants are very much regulated by the cost of gratifying them. One man would purchase an article for a dollar for which he may be unwilling or unable to pay two; while others, rather than forego the purchase, will consent to pay that amount. Those who have commodities to sell, finding that they have more customers than they can satisfy, immediately infer that they are selling them too cheaply, and that they could dispose of all their stock at a higher price. The price is accordingly raised, when the sale becomes limited to those who are not restrained from buying by the increased price. Some commodities are positively necessary for the support of the people, of which the supply may fall very short of the demand and be incapable of increase. This is the case when there is a bad harvest in a country which is excluded from a foreign supply by war or by fiscal restrictions. Here the price rises in proportion to the deficiency of the crops. The competition for food is universal. The number of consumers is not diminished, while the supply is reduced; and the price must, therefore, rise and continue high until a fresh supply can be obtained. A similar effect is produced if the supply, without being deficient, be confined to the possession of a small number of persons, who limit it to the consumers in order to secure higher prices. However abundant corn might be in a besieged town, if one man were exclusively authorized by law to sell it, it might rise to a famine price, unless the people broke into the granaries, or the government interfered with the monopoly. Less in degree, but similar in principle, is the effect upon prices of every limitation of the market by fiscal restriction. When any sellers are excluded, the others are enabled to raise their prices. These are cases in which the supply cannot be increased to meet the demand, or in which the supply is monopolized. But the greater number of commodities may be increased in quantity, and the supply of them is not artificially limited. The price of these also rises when the demand exceeds the supply; but the increased price raises the profit of the producer, and attracts the competition of others in the market. Fresh capital and labor are applied to the production of the profitable article, until the supply is accommodated to the demand, or exceeds it. The prices gradually fall, and at length the profits are reduced to the same level as the profits in other undertakings, or even lower. The encouragement to further production is thus withdrawn, and prices are adjusted so as to secure to the producer the ordinary rate of profits, and no more. — When a supply exceeds the demand, that is to say, when there is more of a commodity than people are prepared to buy, its price must fall. Its sellers must offer it for sale at the price at which they can induce people to purchase. All is now in favor of consumers. They are no longer bidding against each other: but the sellers are competing among themselves to get rid of their goods. The price falls generally in proportion to the excess of the quantity, but this result is very much qualified by the nature of the article. If there be an excess of supply in perishable goods, there is nothing to prevent the natural fall of prices. When fish is unusually abundant, it must be cheap, or a great part of it will be destroyed: it must be eaten at once, or not at all; and to induce people to eat it, it must be offered to them at a low price. But with articles which may be held back, in expectation of higher prices, their value may be partially sustained. Production may be reduced, and the stock gradually brought into the market, until the supply has been equalized with the demand; and wherever the article is such as to admit of voluntary increase or diminution, the natural result of an excessive supply is to reduce production, until the balance of supply and demand has been restored. This mutual adjustment is in perpetual operation, and is ordinarily effected with such precision, that it may be said, without exaggeration, that a large city is supplied exactly with everything its inhabitants require, — even down to an egg or a pint of milk. There is always enough of everything, and rarely too much. — Whenever there is an excessive production of any commodity, it is an evil almost as great as scarcity. It is true that the consumer derives benefit from it, but the producing classes are most injuriously affected. In order to raise the value of the produce of their labor, they must cease to produce, or must produce in less quantities. The workmen are thus either deprived of employment altogether for a time, or are employed for a portion of their time only, at reduced wages; while their employers are disposing of their goods at low prices, which scarcely repay the outlay of their capital. Nor does the penalty of over-production fall exclusively upon those engaged in the trade in which supply has exceeded the demand. Their distresses extend to other classes. It has been shown already that it is to production we must look as the cause of sustained consumption, and thus the pressure upon any considerable branch of productive industry must be sensibly felt by those who have the produce of their own labor to sell. Production has failed, and consumption must therefore be diminished. — The supply of markets is a very speculative business, and is often conducted with more zeal than discretion. When a particular trade is supposed to be more prosperous than others, capitalists rush into it in order to secure high profits; and in this country the abundance of capital, the perfection of our machinery, and the skill of our workmen, enable them to produce with extraordinary facility. Over-production in that particular trade is

the consequence, and all engaged in it suffer from the depreciation in the value of their goods; but if, instead of rushing into the favorite trade, they had distributed their enterprises more widely, their own interest and that of the community would have been promoted. When a ship is wrecked, if all the crew precipitate themselves into one boat, they swamp it; but if they wait till all the boats are lowered, and apportion their numbers to the size of each, they may all reach the shore in safety. And so it is in trade: one trade may easily be glutted, while there is room in other trades for all the capital and industry that need employment. In proportion to the extent of the market, and the variety and abundance of commodities to be exchanged, will be the facility of disposing of the products of capital and labor; and this consideration points out as the most probable antidote to gluts, a universal freedom of commerce. When the free interchange of commodities is restricted, not only is a glut caused more easily, but its causes are more uncertain, and dependent upon unforeseen events. With the whole world for a market, the operation of the laws of demand and supply would be more equable, and the universality of the objects of exchange would make gluts of rare occurrence. The market would still be liable to disturbance by bad harvests, by errors in the monetary system, by shocks to public credit, and by war; but apart from these causes of derangement, demand and supply would be adjusted, and the productive energies of all nations called into full activity.

Demi, a prefix signifying half.

Demijohn [from the Fr. *dame-jeanne*], a large round glass bottle, which is generally encased in osier basket or wicker work to prevent fracture; it holds about two gallons.

Demurrage is applied in commercial navigation to designate the time during which a vessel is detained beyond that originally stipulated in loading or unloading; but it is more commonly applied to the compensation which the freighter has to pay for such detention. The freighter usually agrees to load and unload within a certain time, and comes under a subsidiary stipulation to pay so much by way of *D.* if the time be exceeded, in which case it is generally fixed at a certain rate per day, — Sundays and legal holidays excluded. This holds even in cases where the delay is not occasioned by any fault on the freighter's part, but is inevitable. If, for instance, a ship be detained, owing to the crowded state of the port, for a longer time than is allowed by the contract, *D.* is due; and it is no defence to an action for *D.*, that it arose from port regulations, or even from the unlawful acts of the custom-house officers. *D.* is not, however, claimable for a delay occasioned by the hostile detention of the ship, or the hostile occupation of the intended port; nor is it claimable for any delay wilfully occasioned by the master, or owners, or crew, of the vessel. The claim for *D.* ceases as soon as the ship is cleared out and ready for sailing, though she should be detained by adverse winds or tempestuous weather. See AFFREIGHTMENT, BILL OF LADING, CHARTER-PARTY, SHIPPING.

Demy, the name for a particular size of paper. Drawing demy is 15 × 20; printing demy, 18 × 22½.

Dendrometer an instrument constructed for measuring the heights and diameter of growing timber.

Denim, a coarse kind of blue or brown cotton drill, of which the warp only is dyed. It is extensively manufactured at Lawrence and Lowell, Mass., Saco, in Maine, and other places in New England. *D.* is chiefly used for laborers' overalls.

Denmark, a kingdom lying in the N. W. of Europe, and now reduced to the peninsula of Jutland on the European continent and a group of islands in the Baltic. It lies between lat. 54° 34′ and 57° 44′ 52″ N., lon. 8° 4′ and 12° 34′ E., with the exception of the island of Bornholm, which lies between lon. 14° 42′ and 15° 10′ E. It is bounded N. by the Skagerrack; E. by the Cattegat, the Sound, and the Baltic; S. by the Baltic, the Little Belt, and the German duchy of Schleswig; and W. by the North Sea. Area, 14,553 sq. m. With the exception of Bornholm, which is situated considerably to the E., between Pomerania and Sweden, the islands all lie close to one another, and form a cluster that almost closes the entrance to the Baltic. The largest island, and the nearest to Sweden, is Zealand, or Sjælland; the next in size, Funen, or Fyen, is divided from Jutland by only a minute channel; Lolland, Bornholm, Falster, Langeland, Möen, Samsö, Ærö, Læsö, Taasinge, Anholt, are, in order of their importance, the other noticeable islands. The government is a constitutional hereditary monarchy, the executive power being in the king and his responsible ministers, and the right of making and amending laws in the Rigsdag, or Diet, acting in conjunction with the sovereign. Copenhagen, the cap. of *D.*, is also the only large city and seaport of the kingdom. The colonial possessions of *D.* are the Faroe Islands, Iceland, Greenland, and the Danish West Indies (which last are given under their respective names). The *Faroe Islands* are an archipelago nearly midway between Shetland and Iceland. 17 of these islands are inhabited; the largest is Stromö, on the E. shore of which is built the cap., Thorshavn. *Iceland* is a large island at the N. W. extremity of the map of Europe, just outside the Arctic Circle. It received in 1874 a constitution and an independent administration. The whole peninsula or continent of Greenland is nominally in the possession of *D.*; but in point of fact her dominion there is limited to a few scattered trading stations along the W. coast. It is divided into 2 provinces, N. and S. Of these, the former contained, according to the census of 1876, 4,095 native inhabitants, and the other 5,512. The whole European pop. was only 236. In 1879, the following estimate of the population of *D.* and dependencies was made: —

Provinces.	Area in sq. m.		Population.	
Zealand and Möen	2,793		693,000	
Bornholm	221		34.000	
Loiland and Falster	640		94,000	
Funen, Langeland, etc.	1,302		253,000	
Jutland	9,597		866,000	
		14 553		1,940,000
Faroe Islands		495		10,600
Iceland		30,000		71,300
Greenland		......		9,800
West Indies: —				
St. Croix		60		22,600
St. Thomas		14		14,000
St. John		13		1,000
Total		45,135		2,069,300

The coast of *D.* is generally low and sandy; the whole western shore of Jutland is a succession of sand-ridges and shallow lagoons, very dangerous to shipping. Skagen, or the Scaw, a long, low, sandy point, stretches far into the northern sea, dividing the Skagerrack from the Cattegat On the eastern side the coast is not so inhospitable; on the contrary, there are several excellent havens, especially on the islands. Nowhere, however, is the coast very high, except at one or two points in Jutland, and at the eastern extremity of Möen, where limestone cliffs exist. The long fjords, or firths, into which the proximity of the islands divides the coast, form a distinguishing feature. There is little variety in the surface of *D.* It is

uniformly low, the highest point in the whole country, Himmelbjerget, in Jutland, being only 550 feet above the sea *D*, however, is nowhere low in the sense in which Holland is; the country is pleasantly diversified, and rises a little at the coast, even though it remains flat inland. The landscape of the islands and the southeastern part of Jutland is rich in beech-woods, cornfields, and meadows, and even the minute islets are green and fertile. In the western and northern districts of Jutland this gives place to a wide expanse of moorland, covered with heather, and ending at the sea in low, whitish-gray cliffs. There is a melancholy charm even about these monotonous tracts, and it cannot be said that *D.* is wanting in natural beauty, though of a quiet order It is obvious that in such a country there can exist no rivers. The Gudenaa, the longest of the Danish streams, is little more than a brook. Nor are there any large lakes. Pieces of water of considerable size, however, are numerous; of these the largest are the Arresö and the Esromsö in Zealand, and the chain of lakes of various names near Silkeborg in Jutland Many of these meres, overhung with thick beech-woods, are extremely beautiful The *climate* presents no remarkable features. The country lies at the division between Eastern and Western Europe, and partakes of the characteristics of both. Its climate differs from that of Scotland (which is in the same latitude) less in the nature of the seasons than in the rapidity of their transitions Snow falls on an average on thirty days in the year, and westerly winds are more prevalent than easterly in the ratio of 16 to 10. Storms of wind and rain are exceedingly frequent, particularly in July and August. In the district of Aalborg, in the North of Jutland, a cold and dry N W wind called *skai* prevails in May and June, and is exceedingly destructive to vegetation; while along the west coast of the peninsula similar effects are produced by a salt mist, which carries its influence from 15 to 30 miles inland.

Denmark is pre-eminently a corn land, and the cereals grown are all the usual European varieties; in the light and sandy soils buckwheat takes the place of rye, wheat, barley, and oats. The potato is largely cultivated, as well as pease, clover, vetches, and turnips The usual N. European fruit trees and bushes produce good crops, and even peaches and apricots ripen well in sheltered places. The produce of grass is not very large, the fertility of the ground tempting the farmers to use it all for grain. In relation to its size there is no country in Europe, except Belgium and England, that can compete with Denmark as a corn-producer According to the latest official returns, there are 11,367,310 acres under some sort of crop, fallow, or in grass, or about 65 per cent of the total area of the country; 5,894,495 acres more are in woods and forests. The land in *D* is minutely subdivided, owing partly to the state of the law, which interdicts the union of small farms, and encourages in various ways the parcelling out of landed property The large estates of the nobles are generally in the hands of farmers; but the greater part of the land is possessed by the peasantry, who maintain an hereditary attachment to their ancestral farms The *mineral products* of *D* are too unimportant to require enumeration. It is one of the poorest countries of Europe in this particular. It is rich, however, in clays, while it should be stated that in the island of Bornholm there are quarries of freestone and marble. There is but little coal yet discovered in the country.

Manufactures are not carried on to any great extent The most notable Danish manufacture is the fabrication of porcelain. The nucleus of this important industry was a factory started in 1772, by F H Müller, for the making of china out of Bornholm clay. In 1779 it passed into the hands of the state, and has remained there ever since. Originally the Copenhagen potters imitated the Dresden china made at Meissen, but they are now famous for very graceful designs of their own invention, and their porcelain has a distinct character of its own. The inventions of Thorwaldsen have been very largely repeated and imitated in this charming ware Besides the royal works, there are private factories employing a large number of men. Terra cotta and faïence are also manufactured in Copenhagen The iron-works of *D* have made very considerable progress since the separation of Norway, and they are largely supplied with raw material imported from England There are many iron foundries around Copenhagen, and in that city there are small manufactories of locomotives, and of machinery of various kinds. The woollen, linen, and cotton manuf of *D.* are for the most part domestic, and carried on purely for local consumption Linen is the principal article of domestic industry in Zealand. The woollen manuf occupies about 2,000 men. The sugar refineries, of which the largest are at Copenhagen, prepare most of the sugar required for domestic consumption. Cherry-brandy is also prepared in that city, and largely exported. The making of paper and distillation are carried on at different parts of the country to some extent

Commerce. Formerly the commercial legislation of *D* was to such a degree restrictive that imported manufactures had to be delivered to the customs, where they were sold by public auction, the proceeds of which the importer received from the custom-houses after a deduction was made for the duty To this restriction, as regards foreign intercourse, was added a no less injurious system of inland duties impeding the commerce of the different provinces with each other The want of roads also, and many other disadvantages, tended to keep down the development of both commerce and industry Within the present century, however, several commercial treaties were concluded between *D.* and the other powers of Europe, which made the Danish tariff more regular and liberal. Of no less importance were the regulations made from time to time concerning the Sound toll, a question which in the 17th century led to many hostilities between *D*, Sweden, and Holland. Having formerly possessed both sides of the entrance to the Baltic, the Danish Crown looked upon the Sound as exclusively her own, refusing to admit any foreign vessels without payment of a certain duty, and this right was never successfully contested by the other powers. An exception, however, was made in favor of Sweden, and of late the toll has been entirely abolished The commerce of *D* is carried on mainly with Germany and Great Britain. For the year 1878 the total imports amounted to $64 394,770, and the exports to $50,804.230. The commercial intercourse between *D.*, including the Danish West Indies, and the U States is shown in the subjoined tabular statement, in each of the 20 years, 1859 to 1878:—

Years.	Imports of U. States produce into Denmark			Exports from Denmark to the U. States.
	Domestic	Foreign.	Total.	
1859	990,798	61.079	1.051,877	297,718
1860	1,284,413	44,135	1,328,548	216.925
1861.	912,331	43,695	956,026	266,305
1862	1,007,667	45,627	1,053,294	232,271
1863	1,164,212	50,400	1.214,612	281,838
1864.	1,262,639	52,954	1,315,593	229,777
1865	1 558,166	40,447	1,598.613	294,759
1866	1,288,792	8,295	1,297,087	462.346
1867	1,123,993	48,780	1 172,773	641,871
1868	1,354,732	27,351	1.382,083	608,907
1869	1,674,115	39,121	1,713,236	638,550
1870	1,405,455	82.944	1,488,399	628,870
1871	2,521,394	13,993	2,535,387	673,775
1872.	1,799,898	68,116	1,868,014	780,215
1873.	2.437,506	36,623	2,474,129	473,840
1874	2.430,791	22.156	2.452,947	457,390
1875	1,840,772	9,026	1,849,798	585,847
1876	1,586,684	13,498	1,600,182	394,836
1877...........	4,072,889	8,592	4,081,481	293,523
1878...........	4,042,184	7,613	4.049,797	821,880
Total	35,759,431	724,445	36,483,876	9,281,453

In the year 1878 the principal imports from and exports to the U States (the Danish West Indies excluded) were as follows: *Imports:* Manuf of brass, $72.400; Indian corn, $1,034,519; manuf of hemp, $12,761; fire-arms, $102,400; rosin and turpentine, $18,164; mineral oil, $1.316,601; cartridges, $234,475; bacon and ham, $102.665; lard, $241,588; seeds, $25,000; tobacco leaf, $70,000.—*Exports:* not worth mentioning.

Finances. The annual revenue of the state during the 5 financial years 1874 to 1878 averaged $13,750,000; the expenditure during this period was fully balanced by the revenue, with an annual surplus, employed for the reduction of the public debt. The public debt of *D* which, before the establishment of parliamentary government in 1866, amounted to 262,232,680 kroner, or $72.842,415, was reduced in 1878 to 174,781.950 kroner, or $48,550,540

Banking. The National Bank of *D*, established in 1818, has its head office in Copenhagen, with branches at Odensee and Flensburg It issues notes of 200, 100, 50, 20, and 10 kroner payable in specie on demand, and transacts all sorts of business

Communication, both by land and water, is well provided for in *D* A railroad from the Schleswig frontier proceeds to Fredericia, from whence one branch passes to the extreme north of Jutland, another crosses the island of Funen, from Middelfort to Nyborg. This is the direct line from Germany to Copenhagen. From Nyborg a packet crosses the Great Belt to Korsor, and thence another line runs through Zealand to Copenhagen There is also a South Zealand line, from Roeskilde to Voldingborg, which is continued through the island of Falster, besides a short line in Lolland. On Jan. 1, 1879, the total length of railroads open to traffic was 854 m. The only canal is the Thyborön, a short canal which connects the Lim Fjord (the arm of the sea which penetrates so far into the N. of Jutland) with the German Ocean. There is no direct line of steamers between the U. States and *D.*, the best way to Copenhagen being from New York to Hamburg, and thence by German and Danish railroads.

Money Under a law which came into force on Jan. 1, 1875, the decimal system of currency was introduced in *D.*, the unit being the *krone*, or crown, divided into 100 *ore*. The krone is generally accounted of one half the value of the *Rigsdaler*, the old unit of currency, of which it took the place. 18 krone = $5 (about).

Weights and measures: —

The *Pound* = 100 *Krint*	= 1.102 avoirdupois, or about 100 lbs. to the cwt.
" *Ship Last*	= 2 tons.
" *Tonde*, or Barrel of Grain and Salt	= 3.8 bushels.
The *Tonde*, or Barrel of Coal	= 4.7 "
" *Foot*	= 1.03 foot.
" *Viertel*	= 1.7 gallon.

Commercial marine. On Jan. 1, 1879, the commercial fleet of *D.* consisted of 3,263 vessels, of an aggregate burthen of 260,180 tons. Of these 180, of 43,720 tons, were steamers. Included in this account were all vessels of not less than 4 tons. The mass of the shipping consisted of vessels under 300 tons. Of vessels over 300 tons there were 134, of an aggregate burden of 71,213 tons. To the port of Copenhagen belonged 446 vessels, of a total burthen of 76,518 tons. The principal ports of *D.* are Copenhagen (see below), Helsingör, Korsör, Aarhuus, Aalborg, and Frederikshavn.

Copenhagen, one of the best built cities in Europe, stands on the *E.* coast of Zealand, in lat. 55° 41′ N., lon. 12° 35′ E. Pop. in 1879, 205,000 (with suburbs, 250,000). In going into *C.*, the course is between the buoy on the Stubben Bank to the left, and the buoy on the Middle-grounds, and those in advance of the three Crowns batteries on the right, W. S. W. by compass. From the three Crowns to the roads the course is S. S. W. The water in the channel is from 6 to 4 fathoms deep; but it is narrow, and the navigation rather difficult. There is no obligation to take a pilot on board; but if a vessel wish for one, she may heave to abreast of the battery, when he will come to her. Vessels not intending to come into harbor bring up in the roads, at from ½ to ⅓ mile from shore, in about 4 fathoms, the town bearing S. S W. In the harbor, within the boom, the water is from 17 to 18 feet deep. Vessels in harbor load and unload alongside the quay. The anchorage in the roads is good and safe. — *Credit.* Goods imported into *C.* are commonly sold on credit; 3 months is the term generally allowed on most sorts of goods, and in a few instances 6 months. The discount for ready money is 4 per cent. Bankruptcy is of rare occurrence. — *Commission* on purchases is generally 2 per cent, and on sales 3 per cent, including 1 per cent *del credere.*

Denmark-Satin, a stout worsted stuff used for covering ladies' shoes, etc.

Dennet, a kind of light, open, two-wheeled carriage.

Denrée, the French word for commodity or produce.

Density denotes the quantity of matter which a body contains under a given or determinate surface. This term is commonly used synonymously with *specific gravity*, which, however, refers to comparative weights of equal bulks. Thus quicksilver is said to have a *D.* greater than that of copper, and alcohol one less than that of oil of vitriol.

Dent [the French name for tooth], a mark, an impression. — A tooth of a gear-wheel, of a comb or metallic brush, etc.

Dentelle, the French term for lace.

Dentifrice, a substance applied to the teeth, to cleanse and beautify them.

The solid ingredients used in *D.* should not be so hard or gritty as to injure the enamel of the teeth; nor so soft or adhesive as to adhere to the gums, after rinsing the mouth out with water. Pumice-stone (in fine powder) is one of those substances that acts entirely by mechanical attrition, and is hence an objectionable ingredient in tooth-powder intended for daily use. It is, however, very generally present in the various advertised dentifrices, which are remarkable for their rapid action in whitening the teeth. Bath brick is another substance of a similar nature to pumice, and, like that article, should be only occasionally employed. Cuttle-fish bone, coral, and prepared chalk are also commonly used for the same purpose, but the last is rather too soft and absorbent to form the sole ingredient of a tooth-powder. Charcoal, which is so very generally employed as a dentifrice, acts partly mechanically and partly by its chemical property of destroying foul smells and arresting putrefaction. For this purpose it should be newly burnt, and kept in well-closed vessels until used, as by exposure to the air it rapidly loses its antiseptic powers. Powdered rhatany, cinchona bark, and catechu are used as astringents, and are very useful in foulness or sponginess of the gums. Myrrh and mastic are employed on account of their odor, and their presumed preservative action and power of fixing loose teeth. Insoluble powders have been objected to on account of their being apt to accumulate between the folds of the gums and in the cracks of the teeth, and thus impart a disagreeable appearance to the mouth. To remedy this defect, a reddish or flesh-colored tinge is commonly given to them with a little rose-pink, red coral, or similar coloring substance, when any small portion that remains unwashed off is rendered less conspicuous. Some persons employ soluble substances as tooth-powders, which are free from the above objection. Thus, sulphate of potash and cream of tartar are used for this purpose, because of the grittiness of their powders and their slight solubility in water. Phosphate of soda and common salt are also frequently employed as dentifrices, and possess the advantage of being readily removed from the mouth by means of a little water. Among those substances that chemically decolor and remove unpleasant odors, the only ones employed as dentifrices are charcoal and the chlorides of lime and soda. The first has been already noticed; the others may be used by brushing the teeth with water to which a very little of their solutions has been added. A very weak solution of chloride of lime is commonly employed by smokers to remove the odor and color imparted by tobacco to the teeth. Electuaries, made of honey and astringent substances, are frequently employed in diseases of the gums. The juice of the common strawberry has been recommended as an elegant natural dentifrice, as it readily dissolves the tartarous incrustations on the teeth, and imparts an agreeable odor to the breath. See PASTE, POWDER, and WASHES.

Dentistry is the art of extracting teeth, of treating their diseases and lesions, and supplying artificial substitutes in the place of these organs when lost. The progress of *D.* as a science has been very marked in this country, and has placed American dentists at the head of the profession through the world. The art of *D.* is difficult to acquire, and comprehends in itself processes appertaining to several separate branches of manufacture. It is, however, an extremely useful art, and has done valuable service, since it is not too much to say that in all probability many lives have been saved, and a still greater number prolonged, through the instrumentality of the aid afforded by the use of artificial teeth.

Dentist's chair, a chair provided with numerous adjustments to suit the exigencies of surgical dentistry. The chair itself is pivoted on a stand which has casters. The seat is vertically adjustable, the back inclinable. The head-rest is adjustable vertically and as to inclination.

Denture, an artificial tooth, block, or set of teeth. The former are partial dentures, the latter is a full denture.

Denver. See COLORADO.

Denver and Boulder Valley R. R., from Hughes, Col., to Boulder City, Col., 27 m. This Co., whose offices are in Denver City, Col., was chartered in 1870, and the road opened in 1874. It is leased for 99 years from 1873 to the Denver Pacific R. R. Co., at a rental of 40 % of gross earnings; $550,000 bonds and interest thereon are guaranteed by lessees. *Financial statement*, 1878: Cap. stock, $700,000; funded debt, 1st mortgage 7 % 30-year bonds, dated Oct. 1, 1870, payable Nov. 1, 1900, coupons, May and Nov., $500,000.

Denver and Rio Grande R. R. (in progress) from Denver, Col., to El Paso, Texas, 850 m. Branches, Pueblo, Col., to Cañon City and coal-mines, 42.9 m.; Pucharas, Col., to El Moro, Col., 36 m. It is in operation from Denver to Alamosa, 250.6 m. Offices in Colorado Springs, Col. *Financial statement*, 1877: Cap. stock, $8,500,000; funded debt, $6,628,751.05.

Denver Pacific R. R., from Denver City, Col., to Cheyenne, Wyoming Ter., 106 m. This line, whose offices are in Denver, was opened in 1871, and has been in the hands of a receiver since 1878. *Financial statement:* Cap. stock, $4,000,000; funded debt, $2,271,000; total stock and bonds, $6,271,000. Cost of road and equipment, $6,495,350; cost per mile, $61,276.90.

Deodorizer, any substance having the power of absorbing and destroying fetid effluvia. Chlo-

rine, chloride of lime, chloride of zinc, carbolic acid, nitrate of lead, sulphate of iron, and freshly burnt charcoal are the most effective and convenient *D.* See DISINFECTANT.

Dépenses [Fr.], expenditure.

Depilatory, any substance employed to remove superfluous hairs from the human skin. *D.* act either mechanically or chemically. To the first class belong adhesive plasters, that, on their removal from the skin, bring away the hair with them. The second class includes all those substances which destroy the hair by their chemical action.

The use of Orpiment (sulphide of arsenic), which forms the principal ingredient in most fashionable *D.*, is not free from danger. The two best and safest *D.* are perhaps the following: 1. Take sulphide of sodium (crystallized), 3 parts; quicklime (in fine powder), 10 parts; starch, 10 parts; mix. To be mixed with water and applied to the skin, and scraped off in 2 or 3 minutes with a wooden knife. — 2. Make a paste with a strong solution of sulphide of barium and powdered starch, and apply immediately.

Depoh, a long measure of Sumatra, = 72 inches.

Déport, the French stock exchange term equivalent to the English word BACKWARDATION (q. v.).

Déposant [Fr.], a depositor in a bank.

Deposit, a lodgment. — Money paid on account of a purchase. — A pledge or pawn. — Anything intrusted to the care of another.

Depositor, one who has money lodged in a savings' or other bank, etc. — The owner of goods, etc., entrusted to the care or safe-keeping of another.

Deposit-Receipt, a note or acknowledgment for money lodged with a banker for a stipulated time, upon which an agreed rate of interest is allowed.

Dépot [Fr.], a railroad station. — An agency, warehouse, or temporary repository for goods.

Depreciation, a diminished value; a reduction of worth.

Depth, the measure of anything from the surface downwards.

Deputy, a subordinate officer; one commissioned to act for another, as deputy-commissary, deputy-lieutenant, etc.

Deraa, an Arabian cloth measure. The ancient "deraa belledi," used for local purposes, in measuring linen, etc., made in the country, is 22⅞ inches; but the "deraa Stambouli," employed to measure European cloths, is 26½ inches. Another deraa, the "hindazeh," of 25 inches, is used to measure goods coming from the East Indies.

Derbyshire Cheese. See CHEESE.

Derbyshire Spar. See FLUOR SPAR.

Derelicts, anything forsaken or left. It is used to express vessels forsaken at sea, and found without any person in them. Of this the government has the custody, and the owner may recover them within year and day. An allowance is made for the salvage of *D.* vessels, when it has been attended with danger.

Derham, or **Derhem**, a weight in Persia of 150 troy grains, by which gold and silver are weighed.

Derrick, a form of hoisting-machine, used for lifting machinery, raising wrecks, and other great weights, and transporting them from one place to another. A floating derrick, or crane, consists of an iron pontoon, divided into several water-tight compartments, from the centre of which rises a tripod mast. Across the mast turns a boom of great strength: one arm of the boom is furnished with fourfold blocks, through which pass the chains intended to hoist the weight; the chains pass over the top of the mast to the opposite end of the boom, and thence descend to the side of the vessel, where they are connected with steam-engines in the pontoon. Water is admitted into the compartments of the pontoon as a counterpoise to the weight suspended.

Descarga [Sp.], a clearance at the custom-house; a discharge; the unloading of a ship.

Desertion from the ship by a seaman without just cause, or the justifiable discharge of a seaman by the master for bad conduct, will work a forfeiture of the wages previously earned; and this is a rule of justice and of policy which generally pervades the ordinances of the maritime nations.

By act of Congress, *D.* from the ship is accompanied with a forfeiture of all the wages that are due, and an absence of 48 hours without leave is made conclusive evidence of *D.*; and whatever unjustifiable conduct will warrant the act of the master in discharging a seaman during the voyage, will equally deprive the seaman of his wages. But the forfeiture is saved if the seaman repents, makes compensation or offer of amends, and is restored to his duty. Public policy and private justice here move together, and the maritime ordinances unite in this conclusion. The master has power to remit a forfeiture, and the penalty of forfeiture is not applied to slight faults, either of neglect or disobedience. There must be either an *habitual* neglect, or disobedience, or drunkenness, or else a single act of gross dishonesty, or some other act of a heinous and aggravated nature, to justify the discharging a seaman in a foreign port, or the forfeiture of wages; nor will the admiralty courts, except in cases of great atrocity, visit the offences of a seaman with the cumulated load of forfeiture of wages and compensation in damages. They stop at the forfeiture of the wages antecedently earned, and in the application of the forfeiture the advanced wages are made a charge on the forfeited wages, but the hospital money is apportioned ratably on the wages for the whole voyage. In these regulations, the moderation of the courts, and the solicitude which the peculiar condition and character of seamen excite, are equally manifest. So, if the seaman quits the ship involuntarily, or is driven ashore from necessity, from want of provisions, or by reason of cruel usage and for personal safety, the wages are not forfeited, and he will be entitled to receive them in full to the prosperous termination of the voyage. On the other hand, it is the duty of the seamen to abide by the vessel as long as reasonable hope remains; and if they desert the ship under circumstances of danger or distress from the perils of the sea, when their presence and exertions might have prevented damage, or restored the ship to safety, they forfeit their wages and are answerable in damages. And even when a seaman might well have been discharged in the course of the voyage for gross misbehavior, if the master refuses to discharge him, and leaves him in imprisonment aboard, he will, in that case, be entitled to his wages until his return to the U. States, after deducting from the claim his time of imprisonment. See DISCHARGE OF SEAMEN.

Déshabillé [Fr.], an undress.

Desiatine, a Russian land measure; 104 *D.* make a sq. verst, 3 versts being equal to 2 English miles. As a superficial measure, it is ordinarily equal to 2.70 Eng. acres, or 117,600 sq. feet; but in Kazan it is greater by one half. As an imperial measure in Russia the *D.* is 2,400 sq. sachine or sagene = 21,600 sq. arsheens = 13,066⅔ sq. yards.

Desiccation, a process of extracting moisture by chemical agency or by the use of air and heat. Chloride of calcium, quick-lime, fused carbonate of potash, and oil of vitriol are used for this purpose.

Design. See PATTERN.

Designer, an inventor or draughtsman; one who sketches figures and patterns for enriching stuffs, etc.

De-Silvering. See SILVER-LEAD.

Desk, a writing-flap or inclined table with enclosure.

Des Moines and Fort Dodge R.R. runs from Des Moines, Ia., to Fort Dodge, Ia., 87.20 m. This Co., whose offices are in Des Moines, was organized at the sale, under foreclosure, of the

Des Moines Valley R.R. Co. in 1873. *Financial statement:* Cap. stock paid in: common, $3,000,000; preferred, $1,000,000; funded debt, $2,178,000, consisting of $1,089,000 6% coupon bonds, dated 1874, payable 1905, and $1,089,000 income bonds, payable only in case of surplus.

Despatch, or **Dispatch,** to transmit or forward goods, invoices, or other advices.

Despensero, a Spanish butler; a ship's steward or providore.

Dessert-Service, the china or glass requisite for the after-dinner confections.

Destemper, or **Distemper,** a method of painting in which the pigments are ground up with size and water, with gum-water, or similar vehicles. It is employed in scene-painting, and in the preparation of wall-paper. The rapidity in which the vehicle dries renders it difficult to blend the tints in *D.*

Détaillant [Fr.], a retailer.

Detector, an arrangement in a lock, by which an over-lifted tumbler is caught by detent, so as to indicate that the lock has been tampered with.

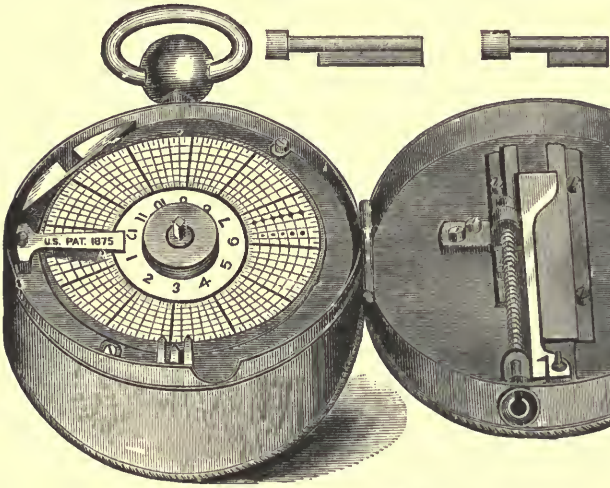


Fig 127. — Imhauser's Watchman's Time Detector.

The Watchman's Time Detector is a very ingenious and useful instrument to check and control the watchman on his duty. Such contrivances have been in use in Europe since the beginning of this century, and have been introduced in the U. States for the last twenty-five years; but it is only from late that they have been brought to a state of perfection, which has won for them a deserved popularity. By the use of this watch-clock on the various stations of the watchman's beat, keys are placed and fastened within or outside the buildings, to indicate the stations by the number up to 12 or more. The watchman, before entering upon his duties in the evening, receives the watch, which is provided with a fresh paper dial. He makes his rounds, and visits the different stations, according to instructions received from his employer. In making his rounds, and arriving at a station, the watchman will insert the key into the keyhole on the side of the watch, and turn it round to the right once; and while doing this, a figure will be punched on the dial of the watch at exactly the minute the hand on the watch shows the time.

The improved instrument, patented by Mr. Wm. Imhauser, of New York, in 1875, 1876, and 1877, and represented in Fig. 127, is so contrived that the insertion of 12 or more different keys, numbered from 1 to 6, mark a figure between the circles 1, 2, 3, 4, 5, or 6, on the paper disk, which is slowly revolving by clock-work; some other keys, numbered from 7 to 12, make a figure on the line of the circles, so that the one does not interfere with the other, as seen on the numbered dial. In this instrument the marking apparatus is in the cover of the case, the watch movement is separate, and therefore secured against dust entering the key-hole. Another important invention and improvement is the safety-lock attachment, which is a provision against the acts of dishonest watchmen, who might open the watch with false keys, and mark the paper dial, without going their rounds. It consists in providing the watch with an additional stationary marker, which marks the dial in a separate circle whenever the case is opened, and also when it is shut again.

Detent, a pin, stud, or lever forming a stop in a watch, clock, tumbler-lock, or other machine. It is variously called in specific cases; as, *click, pawl, dog, fence,* etc. It is usually capable of motion, either at certain intervals, as in some escapements, or by operation of a key, as in locks.

A detent-catch falls into the striking-wheel of a clock, and stops it from striking more than the right number of times. — *Knight.*

Détenteur [Fr.], a holder or possessor of funds, notes, etc.

Detergent, an agent having the power of removing offensive matter from the skin. The name is now generally restricted to applications that tend to cleanse foul wounds and ulcers.

Deterioration, damage done; wear and tear.

Detonation, combustion with explosive rapidity, accompanied with sound and light, as in the case of gunpowder, percussion-caps, and fulminating-powder. When a mixture of oxygen and hydrogen is inflamed by the electric spark, it is said to *detonate. D.* is due either to the sudden liberation and expansion of large volumes of gases, or to the sudden contraction of gaseous matter, and its reduction to a liquid or solid state. See Fulminating Compounds.

Detroit, the metropolis of the State of Michigan, cap. of Wayne Co., and port of entry, situated on the west bank of the Detroit River (from the French for a *strait*), opposite the Canadian town of Windsor. It is about 7 m. S. W. of Lake St. Clair, 55 m. from Lake Huron, and 18 m. N. of Lake Erie, in lat. 42° 20′ N., lon. 83° 3′ W. The river, which there separates the U. States from Canada, is of varying width, being half a mile broad opposite the city, and 5½ fathoms deep, and flows with a pretty swift current. *D.*, with its suburbs, stretches about 5 m. along the river, and the central part extends for about 2 m. back from the shore. The site upon which the city is built rises from the edge of the river, the inclination being gradual, at the rate of about 58 feet per mile, affording the most perfect drainage, which has been taken advantage of by the building of a system of sewers over 80 m. in length, costing $1,264,890, and permeating every quarter of the city. The commercial facilities of *D.* are very extensive. The *D.* river is a connecting link in the

great chain of lake navigation, and affords the best harbor on the lakes. The city is the centre of an extensive railroad system, which presents important channels of transportation in almost every direction. *D.* is the terminus of the Michigan Central and its branches, also of the Lake Shore and Michigan Southern, the Detroit, Eel River, and Illinois, the Detroit, Lansing, and Lake Michigan, the Detroit and Milwaukee, the Detroit and Bay City, the Grand Trunk of Canada, the Great Western of Canada, and the Canada Southern, which crosses the river at Trenton, a few miles below, and has a branch running to the city. 312 vessels, with an aggregate tonnage of 68,307, are owned here, and from 10 to 13 daily lines of steamers run to various points on the lakes. There is a considerable foreign trade with Canada, the imports in 1878 amounting to $944,104, and the exports to $3,492,940. During that year, 3,931 vessels (aggregate tonnage, 683,718) entered, and 3,892 (tonnage, 674,546) cleared the port in the foreign trade; 3,621 vessels (tonnage, 718,428) entered, and 2,857 (tonnage, 694,265) cleared in the coastwise trade. The large quantities of produce, chiefly from Michigan, passing eastward through the city by rail and water, give to *D.* an extensive domestic commerce. The manufacturing industries of the city are extensive and important. *D.* has many foundries, blast-furnaces, copper-smelting works, locomotive and car works, ship-yards, dry-docks, iron-bridge works, safe manufactories, furniture and other establishments using wood as the chief material, and the most extensive tobacco and cigar factories in America, producing each year goods worth many millions of dollars. There are also some pork-packing establishments. The extensive Pullman car works, with a capital of about $12,000,000, are situated here; also one of the seven pin factories in the U. States. The city glass-works produce about $200,000 worth of glass a year, and the copper-smelting works more than $2,000,000 worth of ingot copper from Lake Superior ore. There are in *D.* 10 lines of street railway, with more than 45 m. of track intersecting the city in every direction, and 10 national banks, with an aggregate capital of $3,210,000. The population, which has increased from 21,019 in 1850 to 45,609 in 1860, 79,577 in 1870, and 101,205 (State census) in 1874, is now about 125,000.

Detroit and Bay City R.R. Co., from Detroit, Mich., to Bay City, Mich., 109.80 m., with branches from Lapeer to Five Lakes, 8.75 m.; from Vassar, Mich., to Caro, Mich., 12.75 m.; and from Denmark to Saginaw, 16.75 m. Total, 148.05 m. This Co., whose offices are in Detroit, Mich., was organized in 1871, and the road opened in 1872. *Financial statement:* Cap. stock, $1,325,750; funded debt, 1st mortgage 8% 30-year bonds, $2,180,000, due 1902, and $150,000 due 1903, interest payable May and Nov. Net earnings for 1878, $78,317.34.

Detroit Fire and Marine Insurance Co., of Detroit, Mich., organized in 1866. *Statement*, 1st Jan., 1879: Cap. stock paid up in cash, $250,000; net surplus, $198,858.67; total cap. and surplus, $448,858.67. Risks in force, $10,035,217; premiums, $111,612.34. Premiums received since the organization of the Co., $2,173,364.30; losses paid, $1,253,232.37. Cash dividends paid to stockholders, $205,000; cash dividends paid during the year, $25,000.

Detroit, Grand Haven, and Milwaukee R.R., from Detroit to Grand Haven, Mich., 189 m. Branches: Pontiac to Insane Asylum, 0.65 m., and Corunna Station to Coal Mines, 2 m.; total, 191.65 m. This Co., whose offices are in Detroit, was formed in 1878 by the reorganization of the Detroit and Milwaukee R.R. Co. on the sale of that road to a purchasing committee of its bondholders. The Great Western R.R. Co., of Canada, will henceforth control and operate this line.

Detroit, Hillsdale, and S. Eastern R.R. runs from Ypsilanti to Bankers, Mich., 64.8 m. This Co., whose offices are in Ypsilanti, was originally founded in 1871 as the Detroit, Hillsdale, and Indiana R.R., which was sold under foreclosure in 1874, and reorganized in 1875 under its present title. The first mortgage bondholders purchased the road for $1,168,000, being $16,000 over amt. of mortgage. *Financial statement*, 1878: Cap. stock, $1,350,000. Funded debt, $25,930, consisting of 8% scrip, dated 1 July, 1876, and payable 1 July, 1881. Profit and loss, etc., $23,701.35. Net earnings, 1878, $12,901.14.

Detroit, Lansing, and Northern R.R runs from Detroit to Howard City, Mich., 156.60 m., with branches from Stanton Bridge Junction to Blanchard, Mich., 37.61 m., from Kiddville to Belding, 1.67 m., and from Slaghts Junction to Hemmingway, 1.40 m.; total, 197.28 m. This Co., whose offices are in Detroit, was formed by the consolidation in 1871 of the Detroit, Howell, and Lansing R.R. Co., the Ionia and Lansing R.R. Co., and Ionia, Stanton, and Northern R.R. Co., under the name of the Detroit, Lansing, and Lake Michigan R.R. Co. In 1876 the road was sold under foreclosure, and reorganized under its present title. *Financial statement:* Cap. stock, common, $1,825,617.52; preferred, $2,503,380. Funded debt, $2,876,000, consisting of Detroit, Lansing, and Northern R.R. bonds, $1,975,000, payable 1907, int. 7% (Jan. and July); Ionia and Lansing R.R., $770,000, payable 1889, int. 8% (Feb. and July); Ionia and Lansing R.R., 2d mortgage, $81,000, payable 1880, int. 8% (May and Nov.); D., L., and L. M. Depot grounds, $50,000, payable 1881, int. 7% (May and Nov.). Net earnings for 1878, $372,198.87.

Deviation, in Marine Insurance, is one of the implied warranties, in the contract of insurance, that the voyage insured for shall be strictly adhered to, and so if a different voyage is pursued, or that stipulated for is voluntarily departed from, the contract is terminated, and the underwriter is discharged from liability.

D. does not void the contract, for the underwriter retains his premium, and is liable to all loss up to the point of *D* Though the loss happen after the ship has returned to her proper course, and though it were distinctly proved that it was not caused or even influenced by the *D*, the insurer would still be released, for the contract having been terminated by the *D* cannot become binding again without a new agreement. A *D* is said to be "a voluntary departure, without necessity, from the usual course of the voyage." It is not to be inferred from this that the vessel must have followed the route that can be proved to be the most direct and expeditious, but that she has followed the usual customary track, sanctioned by safety and convenience Therefore, the stopping at certain places in the course of the voyage, though out of the direct line, if it have been customary to do so, is not a *D.*, but a part of the voyage. Still, a few instances where vessels have taken a point out of their direct course will not constitute usage in favor of the practice. If *D.* is once shown to have taken place, the smallness of its extent will not justify it It is *D* if a ship insured, with liberty to touch at a particular port, touches at another. It was formerly maintained that a ship entitled to touch at a port was not entitled to trade there, but it has been since held, that if there is no delay, and no increase of risk, trading is not a breach. If there are several ports of discharge, it is held *D* to visit them in an order different from that in which they appear on the policy, and it certainly is so, if the risk is thereby increased. If the ports of discharge be not specifically named in the policy, they should be taken in their geographical order. It appears to be no *D.* to proceed direct to any one of a set of ports thus insured to, if the others are not visited at all. It is *D.* to touch at a port at which

it is not customary to touch, although the ship must pass it; or, there being several tracks, to select a less safe and eligible one for the purpose of accomplishing objects foreign to the voyage. Where a ship is insured for a voyage, with liberty to touch "at any one port" of some country, it is held to mean a port in the course of the voyage, if the country be so situated as to admit of this interpretation. Unnecessary delay is always a *D* It appears to be considered *D.* to *prescribe* any one of several tracks to the master. If a specific track is predetermined by the insured, it ought to appear on the policy, and if it do not, the underwriter is entitled to expect that he will have the benefit of the master's choice of tracks, whose duty it is, when he is at liberty so to do, to adopt the best. Though there be an intention to deviate, and instructions given to that effect, the underwriter's responsibility will not be affected till the dividing point is reached, and if the vessel be previously lost, he is liable. *D* will be justified by necessity, though proceeding from a cause not insured against, as, from stress of weather, want of repairs, desertion or mutiny among the crew, attempt to escape from an enemy, or the taking advantage of an opportunity of joining convoy in time of war. The ship may deviate to be relieved of part of her cargo, if too heavily laden, or to take in additional cargo, where necessary for ballast *D* to succor ships in distress is held justifiable on principles of public policy It is a general principle that *D* will not be justified, if for the purpose of providing against the consequences of a fault of the insured, so as to allow one warranty to be infringed to cover the infringement of another

Devil, a rag-engine or spiked mill for tearing woollen rags into shoddy, or linen and cotton rags to make paper pulp. — A machine for making wood screws, etc. — A printer's boy. — A firework.

Devis, the French word for estimate.

Devon Cattle. See CATTLE (*neat*).

Dew-Retting. See RETTING.

Dextrin, or **British Gum**, a substance produced from starch by the action of dilute acids, alkalies, and malt extract, and by roasting it at a temperature between 284° and 320° F. till it is of a light brown color, and smells like over-baked bread. *D.* is an uncrystallizable, insipid, odorless, yellowish-white, translucent substance, brittle and friable when thoroughly dried. It dissolves in water and dilute alcohol. It resembles gum arabic, instead of which it is generally substituted for a great variety of purposes. It is employed for sizing paper, for stiffening cotton goods, and for thickening colors in calico printing, also in the making of lozenges, adhesive stamps and labels, and surgical bandages. *Imp.* duty, 20 per cent.

Dhoney, a native coasting vessel in India, sloop-rigged or with two masts, seldom more than 150 tons.

Dhoona, an Indian name for the dammar or resin obtained from the *Shorea robusta*.

Dhoop, an Eastern name for the *Vateria Indica*, a tree the fruit or nut of which, about the size of a large walnut, furnishes a fine solid oil known as Piney tallow, which is wholesome and edible, and also used for lamps.

Dhotee, Dhoty, a waistcloth or loose wrapper; a long narrow strip of cotton or gauze worn by the male Hindoos instead of pantaloons; it is sometimes ornamented with a silk border.

Dhow, an Arabian coasting vessel trading between the Persian Gulf, the Red Sea, and the peninsula of India.

Dhurra, a variable Eastern measure of capacity in the Bombay presidency it contains 10 seers, and is equal to 19 lbs., 11 ounces, 6½ drachms; occasionally it is 12 to 13 seers. In some parts of Guzerat the dhurra, or dhurree, is only 12 lbs., 8 ounces, 7½ drachms, and in Malwa it is but 3 lbs., 12 ounces.

Dhurra, Dourah, a species of *Holcus*, the principal grain crop of Egypt after wheat, which is largely used there by the laboring classes for food, and also forms the currency of Nubia. Varieties of this grain are grown in many parts of Africa.

Diachylon-Plaster, a medicinal adhesive plaster used as a strapping, the basis of which is litharge and olive oil.

Diagram, a rough delineation; an explanatory sketch or drawing.

Dial, or **Sun-Dial**, an instrument for registering time by the sun's rays falling upon an index, or gnomon, whose shadow marks the progress of the hours. There are a variety of *D.*, horizontal, oblique, or vertical, and also depending on their aspect with reference to the sun.

In the construction of a *D.* the object is to find the sun's distance from the meridian by means of the shadow. When this is known, the hour also is known, provided we suppose the sun's apparent motion to be uniform, and that it moves in a circle parallel to the equator during the whole day. In point of fact, neither of these conditions is fulfilled, but the error arising from this is of small amount. Although *D.* have many different constructions, the general principles are the same. The style, gnomon, or axis of the *D.*, is either a cylindrical rod or the edge of a thin plate of metal. It must be parallel to the earth's axis, and thus it may be considered, on account of the smallness of the earth's diameter compared with the distance of the sun as coinciding with the axis of the diurnal rotation; consequently the plane which passes through the centre of the sun and the style will coincide with the shadow, and will turn with the sun as the sun turns round the style, by the effect of the diurnal motion. An *Equatorial D.* is one whose plane is at right angle with the style, and therefore parallel to the equator. It is the simplest of all *D* A circle (Fig 128) divided into 24 equal arcs is placed at right angles to the style, and hour divisions are marked upon it. Then if care be taken that the style point accurately to the pole, and that the noon division coincide with the meridian plane, the shadow of the style will fall on the other divisions, each at its proper time The divisions must be marked on both sides of the *D*, because the sun will shine on opposite sides in the summer and in the winter months, changing at each equinox.

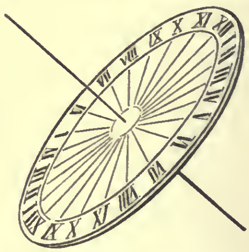


Fig. 128. — EQUATORIAL DIAL.

Dial-Plate, the face of a clock or watch on which the hours are marked, or of a dial on which the lines are drawn.

Dialyser, in practical chemistry, an instrument for separating substances by dialysis, or diffusion through a system of gelatinous matter. In its most convenient form it consists of a hoop of gutta percha, over which a circular piece of parchment paper is stretched. The paper is applied to the hoop while wet, and is kept stretched by a second hoop, by an elastic band, or by a few turns of string. The instrument, when complete, resembles an ordinary tambourine. It is distinguished as the *hoop D.* The fluid to be "dialysed" is poured into the hoop upon the surface of the parchment paper, to the depth of about half an inch, and the dialyser is then floated upon water in a large glass basin. Another form of *D.*, termed the *bulb D.*, consists of a small glass bell-jar, the mouth of which is covered by a piece of parchment paper. This is suspended or otherwise supported in a large vessel of water in such a manner that the parchment paper septum just dips below the surface.

Diameter, width; measurement across the centre.

Diamond, the smallest kind of regular printing-type that is cast in American and British foundries.

Diamond [Dutch, Fr., and Ger., *diamant:* It., Port., and Sp., *diamante;* Latin, *adamas*], the most highly valued and brilliant of precious stones,

which seems to have attracted notice at a very early period, especially in India, the chief source of supply in ancient times. Its most frequent forms are the octahedron, or double four-sided pyramid, the rhombic dodecahedron with 12 faces, and others with 24 and 48 faces. Cubes also occur, but are rare. Many of the crystals are round almost like spheres, or the smaller ones like grains of sand. This does not arise, however, from attrition during transport by water, but is the original shape of the stones. *D.* is only pure carbon in the crystallized condition, and like it insoluble in acids. It has a perfect cleavage parallel to the faces of the octahedron, and breaks readily both in this and other directions. Contrary to the old and still common opinion, it is rather brittle, and is easily injured by a slight blow or fall. Its hardness — 10 in the mineralogical scale — far surpasses that of all other known stones. In sp. gr. 3.52 (or 3.515 to 3.525), it is considerably higher than rock crystal, but nearly the same as the topaz, which may thus be mistaken for it. By friction it becomes positive electric. The so-called compact *D.*, or *carbonado*, of the stone-polishers, found as round grains or masses of 1 to 2 lbs. weight in the washings near Bahia, of a brownish black color and sp. gr. = 3.012 to 3.416, is porous *D.* mixed with a small amount of other matter. — The optical properties of *D.* are also very remarkable. The purest stones, or those of the first water, are highly transparent and colorless. But more generally it is less transparent, and shows various tints, especially white, gray, or brown; more rarely blue, red, yellow, green; and very seldom black. Such stones, when the colors are pure, are often highly valued. It is also distinguished by its brilliant adamantine lustre. *D.* is infusible before the blowpipe, and closely packed in powdered charcoal it can resist a very high temperature. But when oxygen is present it burns slowly at a temperature usually given at about that of melting silver. There has been much speculation regarding the mode of origin of these gems, but hitherto leading to no certain results. It may here also be mentioned that all attempts to produce *D.* artificially have hitherto failed. India is the oldest, and was long the most celebrated or rather the only source of *D.* During the end of the last and the beginning of the present century the supply of *D.* came chiefly from Brazil. They were first recognized in 1727 in the province of Minas Geraes, where they had been long used by the negroes as counters in playing cards. The principal mines are still in that province near Diamantina (formerly Tejuco), and near Diamantino in Matto Grosso. Mines have also been recently worked in the province of Bahia. Other localities are enumerated in the article Brazil. The *D.* are chiefly obtained from the Cascalho, a loose, gravelly deposit mixed with red clay, and containing large lumps of quartz and grains of gold. When first brought to Europe the Brazil *D.* were regarded as inferior to those from India, but without reason. Though the mines are strictly watched as Crown property, the produce is not well ascertained. Martius estimated that in the 46 years from 1772 to 1818, *D.* weighing about 3,000,000 carats, and worth $35,000,000, were exported. Mr. Mawe stated the produce at 25,000 to 30,000 carats annually of rough *D.*, equal to 8,000 or 9,000 carats when reduced to brilliants. After his time it seems to have greatly decreased, and the discovery of the Cape *D.* has further reduced the amount. The stones are mostly small, averaging little more than one carat, and very rarely exceeding twenty carats. The largest *D.* from Brazil was long, an uncut octahedron of 120 carats, but in 1854 a fine stone of 254½ carats was sent to London. It was an irregular dodecahedron, but of brilliant lustre and with no flaws. Since cut it weighs about 124 carats, and is known as the "Star of the South." *D.* have been found in Mexico, in Georgia, N. Carolina, California, and Arizona. They have also been discovered on the European side of the Ural Mountains, and in Australia; but far more important are the *D.* fields of S. Africa. In 1867 a Dutch farmer obtained from a boer a bright stone which his children were using as a plaything. This stone was sent to the Cape, where its true nature as a *D.* was recognized, and subsequently forwarded to the Paris exhibition and sold for $2,500. This valuable discovery soon led to further researches, and *D.* were obtained from various places near the Orange and Vaal rivers in Griqua Land West. They were first collected by washing recent alluvial or supposed lacustrine deposits, apparently the detritus of rocks in the vicinity, that are spread over the lower river valleys, but are now rather sought for in "pans," or "pipes," of a circular form running down into the inferior strata, or shale, and filled with a peculiar igneous rock, named diabase, or gabbro, often much changed near the surface. Throughout this rock, which has been penetrated to a depth of from 100 to 200 feet, *D.* are disseminated, weighing from over 150 carats down to the 100th of a carat, or less. Many are entire, well-formed crystals, but a large proportion are broken and isolated fragments. Hence it has been inferred that the rock in which they now occur is not the matrix or mother rock in which they were originally formed, but that the "pipes" are rather channels by which volcanic matter has made its way to the surface, bringing the *D.* along with it from some inferior deposit. However this may be, *D.*-digging has become a regular branch of industry to a large population; and it is probable, though no very accurate estimate can be formed, that nearly $75,000,000 worth of *D.* have been obtained from this district since their discovery. The largest *D.* from the Cape we have seen mentioned is the Stewart, of 288⅜ carats, found on the Vaal River in 1872. It was an irregular octahedron of the purest water, and 1½ inch in diameter, and is of a light yellow since cut. *D.* are chiefly used and valued as ornamental stones, and for this purpose they are cut in various forms according to the original shape of the crystals. It is probable that the Indians knew some method of doing this at an early period, and it is said there were diamond-polishers in Nuremberg even in 1373. Berghem of Bruges has the credit of having first used, in 1456, their own powder for this purpose. He found that by rubbing two *D.* on each other their surfaces were polished and facets formed, and acting on this hint, he employed diamond powder and a polishing-wheel. His countrymen continued to follow out the art with great success, but some two centuries ago the English cutters were the more celebrated. The trade then reverted to Holland, but is again returning to Britain, where many of the finest stones are cut. The method has undergone little change, and is still chiefly effected by the hand, partly by rubbing one stone on another, partly by a wheel and diamond powder. Where there are flaws or large pieces of value to be removed, they are occasionally cut by iron wires armed with the powder, or split by a blow of a hammer and chisel in the direction of the natural cleavage.

The latter is, however, a dangerous process, as the *D.* is very brittle, and many valuable gems have been thus destroyed. When reduced to a proper form, the facets are polished on a lapidary's wheel. The process demands not only great skill, but much time and labor. The period required to reduce a stone of 24 or 30 carats to a

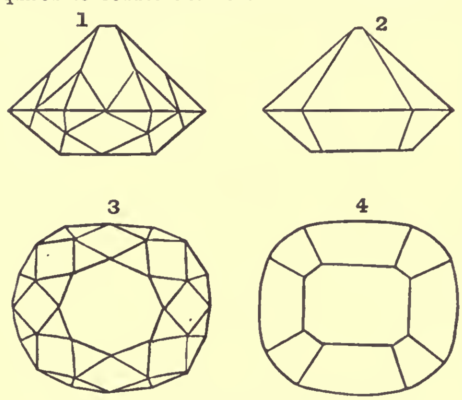


Fig. 129. — SHOWING CUTTING OF BRILLIANTS.

regular form extended formerly to at least seven or eight months of constant work; but the time is now greatly shortened by the use of machinery driven by steam. Jewellers have long cut *D.* in three forms, — the brilliant, the rose, and tables. The *brilliant* is most esteemed, as giving highest effect to the lustre, and implying less reduction of the stone. It is, as it were, a modification of the

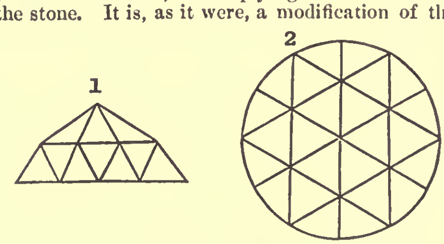


Fig 130. — ROSE-CUT.

primary octahedron, the most common form of crystal, and is shown in its first form in 1 and 2, Fig. 129, and with the full number of facets in 3 and 4 of the same Fig. The upper surface, with the *table*, or principal face, in the middle, surrounded by the *bezil*, or upper faces, lying between its edge and the *girdle*, or common base of the two pyramids, is shown in 1 of Fig. 129. The lower facet corresponding to the table is

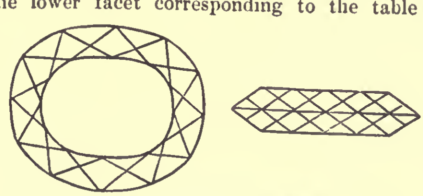


Fig. 131. — TABLE-DIAMONDS.

named the *collet*, and the whole portion below the girdle the *collet* side. Brilliants are usually set open, both the upper or table side and the lower collet-side being exposed. The *rose*-cut (Fig. 130, 1 upper view, 2 lateral view) is given to stones which have too little depth to be cut as brilliants; it has the whole upper curved surface covered with equilateral triangles. The *table-D.* (Fig. 131), the least beautiful, is adopted for broad stones of trifling depth, showing a series of four-sided facets above and below the girdle. Recently brilliants are cut in the *star* form (taille à étoile), with the table above only one fourth the diameter, and thus with less loss of weight. There are also "mixed" or less regular forms used to suit the shape of the stone; and even splinters of *D.* of $\frac{1}{500}$ carat are faceted. In all the forms the girdle ought to be perfectly smooth, as a rough edge often appears through some of the facets as a flaw, and injures the brilliancy of the stone. The value of *D.* is determined chiefly by their size, purity, color, freedom from flaws or stains, and the skill with which they are manufactured. Their weight is reckoned by the carat, or four *D.* grains, originally an Indian weight. In England the carat is estimated as = 3.174 grains troy; but it varies in different places, being, according to Schrauf, in Amsterdam = 205.70 milligrammes, in Florence = 197.20, in London = 205.409, in Madras = 207.353, in Paris = 205.50, and in Vienna = 206.13. The usual rule is that the value of the stone increases with the square of the weight in carats, and assuming \$40 to \$50 as the value of a cut brilliant of first quality in water and shape weighing 1 carat, a similar stone of 2 carats would be worth 4 (2 × 2) times \$40 or \$50, *i. e.* \$160 to \$200; one of 3 carats, nine (3 × 3) times, or \$360 to \$450; and so in proportion. Fine brilliants, however, of the sizes most in demand sell much higher, or from \$60 to \$100 or more the first carat; whilst roses and tables are of considerably smaller value, and rough or uncut *D.*, generally sold in lots, fetch only about \$10 or even less, the value being further diminished in all cases where the stones are "off color," that is, milky or tinted, or imperfect in other respects. Still more important is the state of supply and demand, especially for the largest and most valuable stones, for which there are often very few purchasers, and their price is thus lower than the rule would imply. Even political events affect the price by bringing many into the market, as at the time of the first French Revolution. Cape *D.* are stated to be worth, — yellows under 5 carats, \$10 to \$12.50; above that weight, \$15 to \$20 per carat; pure white stones under 5 carats, \$15 to \$20; and above 5 carats, \$20 to \$35, or more, according to form or lustre.

Perhaps even more important is the use of the *D.* for cutting glass, for polishing gems and other hard bodies, and recently by engineers for boring-machines, used in forming tunnels and artesian wells. The glazier's *D.* is about the size of a pin's head, and is set in copper or brass. The curvature of the fracture faces gives a sharp edge that cuts and not scratches merely. Each costs about \$3 to \$4.50, and, as it will weigh only about $\frac{1}{60}$th carat, the price is higher than that used as gems. For polishing purposes the so-called *bort*, *i. e.* stones so imperfect in form and quality as to be useless for ornament, are broken down and crushed into *D.* powder. The carbonado from Bahia is also employed both for polishing and for boring-machines. In the latter the stones are fixed in a ring of steel, made to revolve with great rapidity, and kept cool by a current of water, which also removes the detritus. In consequence its price has risen lately from about 25 cents to \$4.50 or \$5 a carat.

Tests of D. — To ascertain whether any specimen is a true *D.* or not, a fine file may be used; and if the surface of the

stone be the least abraded or scratched by its action, it is not a *D.* The difference will also appear upon close examination without this instrument; the rays of light easily pass through other gems, but in the *D.* they are refracted to the surface, which occasions superior brilliancy.

Imp. duty: dust or bort, free; rough or uncut, free; glazier's, free; cut, 10 per cent; set, 25 per cent.

Diamond Bort or **Powder**, the crushed refuse fragments of the gem, which is used by lapidaries, seal-engravers, watch-jewellers, and others.

Diamond Cement. See Cement (*Armenian*).

Diamond-Cutter, a lapidary; one who cuts, sets, and works gems.

Diamond-Drill. See Drill.

Diamond-Pencil, a glazier's diamond set in a socket of steel, lead, or silver, with a wooden handle. See Diamond.

Diaper [Dutch, *drel;* Fr. *linge ouvré;* Ger. *Drell;* It. *tela tessuta a opere;* Sp. *manteles alemaniscas*], a kind of textile fabric, either of linen or cotton, or a mixture of the two, with a figured pattern on the exterior surface, produced by a peculiar method of twilling. *D.* are much used for table-linen and fine towels. With the exception of damask, *D.* are the most ornamental kind of twilled cloths. The name is a corruption of *d'Yprès*, a town of Flanders where it was first manufactured. It is also manuf. in Ireland, France, Germany, and Scotland.

Diaphane, a woven silk stuff with transparent and colored figures.

Diaphoretics, sweating medicines.

Diary, a note-book or journal; a register or record of daily business or events.

Diastase, a chemical substance extracted by water from crushed malt, which possesses the remarkable property of converting starch into sugar in an hour or two.

Diastimeter, a philosophical instrument for measuring distances.

Dibble, a small spade. — A pointed garden instrument for making holes in the ground for planting.

Dice (plural of *die*) [Fr. *dés* (*à jouer*); Ger. *Würfel;* It. *dadi;* Sp. *dados*], small cubes used in playing certain games of chance. They are made of bone, ivory, or close-grained wood, having their six sides marked with dots or pips from one up to six. These dots are so arranged that the numbers on two opposite sides taken together always count seven. The dice are shaken in a box called a *dice-box*, and then thrown on a board or table, and the number of dots on the upper faces decides the game. *Imp.* duty, 35 per cent.

Dicker, a commercial term for ten of some things, and for the long hundred, of others; as ten skins make a dicker of hides, ten bars a dicker of iron, ten dozen a dicker of gloves, and so on. See Daiker.

Dicky, a loose shirt-front to be worn over a soiled shirt.

Die (plural *dies*), a stamp or reversed impression used for striking medals, coining, etc. Dies are also required for a variety of purposes, such as the manufacture of buttons, steel seals, screws, and ornamental articles of metal, calico-printing, etc.

Die-Sinking. The preparation of dies for stamping coins and medals is a work requiring considerable skill and care. The steel selected should be of moderately fine grain and uniform texture, and, when polished, should show no spots or patches under a magnifying glass. Two short lengths having been cut from bars of this, and forged into rough dies, are next made as soft as possible by careful annealing, — being put in an iron pot of animal charcoal, heated to a cherry red, and allowed to cool gradually. After being faced up flatly and smoothly in a lathe, they pass into the hands of the engraver, who traces upon them their appropriate images, obverse and reverse, and works these out, with steel tools, in intaglio. (The inscription is generally stamped with punches and hammer.) The new *matrices*, or maternal dies, when, after repeated impressions on clay, etc., and alteration, they are found correct, are ready for hardening, — a process simple enough as regards plain steel, but here very critical, seeing that a delicate engraving has to be kept intact. Each matrix is first protected with a mask, composed of fixed oil thickened with animal charcoal, or of lampblack and linseed oil. They are then placed face downwards in a crucible, and burned in animal charcoal. After being heated to a cherry red, they are taken out with a pair of tongs, plunged in a large body of water, moved about rapidly till all noise ceases, and left in the water till quite cool. If the matrix pipes or sings, there is probably a crack in it. The hardened die is next polished and tempered, — the former by holding it against a running iron disk coated with flour-emery and oil; the latter by putting it in water, which is gradually raised to the boiling point, then allowing it to cool slowly, or by placing it on a heated bar of iron till it acquires a rich straw-color. To increase its strength an iron ring may be shrunk upon it like a mechanical jacket. The matrix, treated as here described, might now be used to multiply coins or medals, but it is preferred to use it for first producing *punches*, or steel impressions in relief. With this view a steel block is procured, softened by annealing, and turned in the lathe, being made flat at the bottom and obtusely conical at the top. The block is put in the bed of a die-stamping press, and the matrix brought down on it with force by means of the central screw. Thus a copy is produced in relief on the conical surface. Further strokes may be required to perfect it, and the punch is therefore first re-annealed (its surface having been hardened by compression), then replaced in the press; the matrix, detached from the screw, is fitted on to it, and pressed in contact by the descent of a block of steel attached to the screw. Thus, after repeated blows and frequent annealing, the impression is completed, and after being retouched by the engraver is hardened and tempered like the matrix. The matrix is now laid aside, and the punch used to produce any number of steel dies by an operation substantially similar to that by which the punch itself was obtained. These are, of course, fac-similes of the matrix, and when completed are used for purposes of coinage.

Dieppe. See France.

Dietary, a table of rations supplied daily, on board ship, or to soldiers, persons in prisons, workhouses, etc.

Digest, an abstract of a speech or decision; a compendium or summary of mercantile law, disposed under proper heads.

Digester, a metal vessel with a detached cover to be screwed down, and some elastic interposing substances to prevent the loss of heat by evaporation. It is chiefly used in chemical operations to raise the boiling fluid to a higher temperature than the ordinary boiling point of 212° F. It is employed in obtaining gelatine from bones, which could not be done at the usual temperature.

Digging, the operation of moving, stirring, or breaking up earth with a spade, pickaxe, or other sharp instrument or machine.

Diggings, a popular name for the localities where gold is found in California, Australia, etc.

Digitalis, a genus of plants of the order *Scrophulariaceæ*. The Foxglove (*D. purpurea*) has narcotic and poisonous leaves and seeds, which are valued for their medicinal properties. The fresh leaves are cathartic and emetic, and when dried are administered in diseases of the heart, brain, and nervous system, in which they act as a powerful sedative. They contain a crystalline principle called *digitalin*.

Digue, a sea-wall, breakwater, or dike.

Dike, in engineering, a work of stone, timber, or fascines, raised to oppose the entrance or passage of the waters of the sea, a river, lake, or the like.

Dilapidation, waste or decay in buildings, etc.

Dilator, a surgical instrument for extending parts, such as the eyelids, or dilating the walls of a cavity.

Diligence, a French stage-coach.

Dill-Oil, an essential oil, obtained from the seeds of *Anethum graveolens*, which are stimulant and carminative.

Dime, a silver coin of the U. States, the tenth part of a dollar; there are also half-*D.*: both legal tenders to the amount of five dollars. *D.* and half-*D.* were authorized to be coined by act of April 2, 1792; weight, 41.6 and 20.8 grains; fineness, 892.4. By act of Jan. 18, 1837, weight was changed to 41¼ and 20⅝ grains, and fineness to 900; by act of Feb. 21, 1853, weight was changed to 38.4 and 19.2 grains. By act of Feb. 12, 1873, the weight of *D.* was changed to 2½ grams, or 38.58 grains, and the coinage of half-*D.* was discontinued. Total amount of *D.* coined to close of fiscal year ended June 30, 1878, $16,904,677.30. Total amount of half-*D.* coined, $4,906,946.90.

Dimension, the extension of a body considered as capable of being measured; bulk, extent, capacity.

Dimity [Fr. *basin;* It. *dobletto;* Sp. *dimite*], a cotton stuff, similar in fabric to fustian, from which it differs chiefly in having ornaments woven in it, and in not being dyed. Its color should be delicately white. In the weaving, longitudinal stripes are usually raised just above the surface of the piece, and dimities are called *single corded* or *broad striped*, according to the flatness and breadth of these stripes.

Dingy, a small ship's boat. It is clinker-built, from 12 to 14 feet, and has a beam one third of its length.

Dining-Table, a massive, solid table usually supported on four legs, sometimes extensible and capable of being materially enlarged by extra leaves or flaps.

Dioptric Light. See LIGHTHOUSE.

Diorama, a mode of scenic representation, which does not possess all the advantages of a panorama, but produces a far greater degree of optical delusion. The peculiar effects of the *D.* arise more particularly from the contrivances employed in exhibiting the painting. In the first place the picture is viewed through a proscenium; the room in which the spectators are is almost in darkness; and the light, which is admitted through colored glass, falls upon the picture alone. It is principally used to illustrate architectural and interior views. By means of slides and shutters the light can be increased or diminished at will, and hence very pleasant effects may be represented; such as the ordinary change from daylight to sunshine, and from sunshine to cloudy weather, or twilight.

Dip, the vertical angle which a freely suspended magnetized needle makes with the horizon. — The geological term for the angle at which strata slope downward into the earth. This angle is measured from the plane of the horizon, and may be readily ascertained by the common spirit-level and plummet, or, as is usual among geologists, by a small pocket-instrument called the *clinometer*. To describe the opposite of *dip*, the term *rise* is used; and, as every bed that dips in one direction must necessarily rise in another, either may be used, according to the position of the observer.

Dippel's Oil, an empyreumatic oil produced during the destructive distillation of bones.

Dipper, an instrument used in photography for immersing negative plates in upright baths containing nitrate of silver, hyposulphide of soda, cyanide of potassium, etc., and withdrawing the same after sensitizing or fixing. They are slender flat strips of hard rubber, wood, glass, porcelain, and sometimes silver wire, having short projections upon which to rest the edge of the plate, which stands nearly upright in the bath while the chemical changes take place. (*E. H. Knight.*) — The vatman in a paper manufactory.

Dipping, the process of heigthening in color small, ornamental brass-work by cleansing in an alkaline lye, scouring with sand and water, dipping into a bath of pure nitrous acid for an instant, washing with water, drying in sawdust burnishing, and lacquering. — The process of washing sheep to cleanse the fleece before shearing. — In photography, immersing the collodionized plate in a sensitizing bath. — The plunging wicks in the tallow-vat, the wool or fabric in the dye-tub, the paper forms in the pulp, etc. — The Scotch name for *dubbing*. See DUBBING.

Dipping-Needle, an instrument for indicating the direction of magnetic force. It consists of a graduated horizontal brass circle, *m* (Fig. 132), supported on three legs, provided with levelling screws. Above this circle there is a plate, A, movable about a vertical axis, and supporting by means of two columns a second graduated circle, M, which measures the inclination. The needle rests on a frame, *r*, and the diameter passing

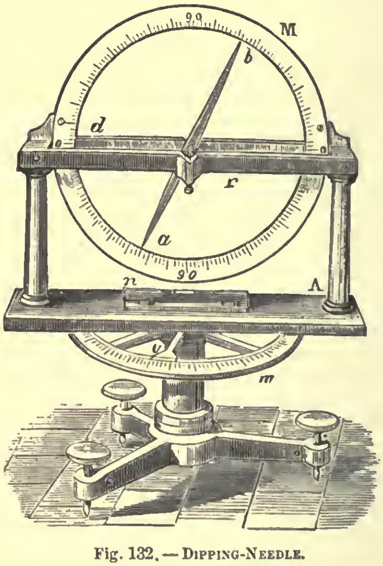


Fig. 132. — DIPPING-NEEDLE.

through the two zeros of the circle, M, can be ascertained to be perfectly horizontal by means of the spirit level, *n*. To observe the inclination, the magnetic meridian must first be determined, which is effected by turning the plate A on the circle *m*, until the needle is vertical, which is the case when it is in a plane, at right angles to the magnetic meridian. The plate A is then turned 90° on the circle *m*, by which the vertical circle, M, is brought into the magnetic meridian. The angle, *d c a*, which the magnetic needle makes with the horizontal diameter, is the angle of inclination.

Dips, a common name for small or store candles, which are made by merely dipping cotton wicks repeatedly in a cistern of melted tallow.

Director, a manager; a member of a board, one of a number of persons chosen by a plurality of votes from among the body of shareholders to conduct the affairs of some joint-stock undertaking, as a bank, railroad, insurance company, and the like.

Directory, an alphabetical address or guide-book to the inhabitants, trades, etc., of a city, with their places of abode.

Dirk, a short dagger.

Disbursements, money paid out.

Discharge, the unloading of the cargo of a vessel. — Release from obligation, debt, or penalty; an acquittance.

Discharging-Rod, an instrument much used in electricity for discharging Leyden jars without partaking of the shock. The jointed *D.* is that most generally employed. It consists of two brass wires, terminated by two brass balls. The wires are jointed at the middle, and are attached to a glass handle. With this instrument it is easy to discharge a jar or battery, by bringing one ball in contact with the exterior, and the other with some part of the interior. The glass handle, as an insulator, forms a protection from all the effects which take place in the restoration of electrical equilibrium.

Discolored, altered in color; stained or tarnished.

Discount, an allowance paid on account of the immediate advance of a sum of money not due till some future period. A bill or note is said to be discounted when a third party, in respect of the credit of the names on it, agrees to pay its contents to the holder before it becomes due, deducting the interest, and, in some cases, commission for trouble and expense. When a bill of exchange is presented at a banker's for discount, it is the practice to calculate the simple interest for the time the bill has to run, including the days of grace, which interest is called the *discount;* and this being deducted from the amount of the bill, the balance is paid over to the presenter of the bill. This is the method followed by bankers, and by commercial men in general. But it is, notwithstanding, inaccurate. The true discount of any sum for any given time is such a sum as will in that time amount to the interest of the sum to be discounted. Thus, if interest be *seven* per cent, the proper discount to be received for the immediate advance of \$100, due 12 months hence, is not \$7, but \$6.54, for this sum will, at the end of the year, amount to \$7, which is what the \$100 would have produced. Those, therefore, who employ their money in discounting make somewhat more than the ordinary rate of interest upon it; for a person discounting \$100 due at the end of a year advances, supposing interest to be \$7 per cent, only \$93; so that, as this \$93 produces \$100 at the period in question, the interest received has really been \$7.46 per cent.

The rule for calculating discount on correct principles is as follows: As the amount of \$100, increased by its interest at the rate and for the time given, is to the given sum or debt, so is the interest of \$100, at the rate and for the time given, to the discount of the debt. Thus, to find the discount of \$100 for one year at 7 per cent, we have: —

$$\$107 : \$100 : : \$7 : \$6.54$$

which is 46 cents less than the interest for the same time; *the difference being in all cases equal to the interest on the discount for the given time.*

The name of discount is also applied to certain trade allowances upon the nominal prices of goods. In some branches of trade these allowances vary according to the circumstances which affect the markets; and what is called discount is in fact occasioned by fluctuations in prices which it is thought convenient to maintain nominally at unvarying rates. — The term discount is also employed to signify other mercantile allowances, such, for example, as the abatement of 12 per cent made upon the balances which underwriters, or insurers of sea risks, receive at the end of the year from the brokers by whom the insurances have been effected. The word "discount" is further used, in contradistinction to premium, to denote the diminution in value of securities which are sold according to a fixed nominal value, or according to the price they may have originally cost. If, for example, a share in a railroad company, upon which \$100 has been paid, is sold in the market for \$98, the value of the share is stated to be at 2 per cent discount. See Interest.

Discount-Broker, one who cashes bills of exchange, or makes advances on securities.

Discount-Day, the day of the week on which a bank discounts notes and bills.

Dish, a broad open vessel of earthenware or metal, for holding food. — A large trough having a capacity of 672 cubic inches, in which miners measure ore.

Dishonored, a commercial term for the return, unpaid, of a draft or acceptance legally due when presented.

Disinfectant, any agent or substance employed to prevent the spread of contagious or infectious disease. Recent investigations all tend to demonstrate that the efficiency of any *D.* is due to its power of destroying, or of rendering inert, specific poisons or disease germs which possess in themselves an independent existence; and which, when introduced into the animal system under favorable conditions, increase and multiply, thus producing the phenomena of special diseases. Therefore, antiseptic substances generally, which check or stop putrefactive decay in organic compounds, by preventing the growth of those minute organisms which produce putrefaction, are, on that account, *D.* So also the deodorizers, which act by oxidizing or otherwise changing the chemical constitution of volatile substances disseminated in the air, or which prevent noxious exhalations from organic substances, are in virtue of these properties effective *D.* in certain diseases. A knowledge of the value of *D.*, and the use of some of the most valuable agents, can be traced to very remote times; and much of the Levitical law of cleansing, as well as the origin of numerous heathen ceremonial practices, are clearly based on a perception of the value of disinfection.

The means of disinfection, and the substances employed, are very numerous, as are the classes and conditions of disease and contagion they are designed to meet. Nature, in the oxidizing influence of freely circulating atmospheric air, in the purifying effect of water, and in the powerful deodorizing properties of common earth, has provided the most potent ever-present and acting disinfecting media. Of the artificial *D* employed or available three classes may be recognized: 1st, volatile or vaporizable substances, which attack impurities in the air; 2d, chemical agents for acting on the diseased body or on the infectious discharges therefrom; and 3d, the physical agencies of heat and cold. In some of these cases the destruction of the contagion is effected by the formation of new chemical compounds by oxidation, deoxidation, or other reaction, and in others the conditions favorable to life are removed or life is destroyed by high temperature. Of the first class — aerial *D* — those most employed are the gaseous sulphurous anhydride, the fumes of nitrous acid and other acid substances, including vaporized carbolic acid, with chlorine gas and the vapors of bromine and iodine. The use of sulphurous anhydride, obtained by burning sulphur, is of great antiquity, and it still is unequalled as a *D.* of air on account both of its convenience and general efficacy. Camphor and some volatile oils have also been employed as air *D.*, but their virtues lie chiefly in masking, not destroying noxious effluvia. In the 2d class — non-gaseous disinfecting compounds — all the numerous antiseptic substances may be reckoned; but the substances principally employed in practice are oxidizing agents, as potassic manganates and permanganates (Condy's fluid), and solutions of the so-called chlorides of lime, soda, and potash, with the chlorides of aluminium and zinc, soluble sulphates and sulphites, solutions of sulphurous acid, and the tar products, — carbolic, cresylic, and salicylic acids. Of the physical agents, heat and cold, the latter, though a powerful natural *D.*, is not practically available by artificial

means; heat is a power chiefly relied on for purifying and disinfecting clothes, bedding, and textile substances generally. Different degrees of temperature are required for the destruction of the virus of various diseases; but as clothing, etc., can be exposed to a heat of about 250° Fahr. without injury, provision is made for submitting articles to nearly that temperature.

Disintegrator, a machine for grinding or pulverizing bones, guano, etc., for manure. — A mill in which grain is broken into a fine dust by beaters projecting from the faces of parallel metallic disks revolving in contrary directions. See FLOUR-MILL.

Dismantled, said of a vessel laid up in dock with her spars, upper masts, rigging, etc., removed.

Dispatch, or *Despatch*, a letter, etc., forwarded by an express messenger. To send away in haste, as a messenger, letters, etc.

Dispensary, a place where medicines are made up and distributed; but used more generally for a charitable institution, where the poor are supplied with medicines and advice. Institutions of this nature are now to be met with in every town of any importance, both in this country and in Europe. To every *D.* there are always attached one or more physicians, surgeons, and apothecaries, whose duty it is respectively to prescribe and dispense medicines to the poor, and to visit them in their own houses in the event of their being too ill to attend personally at the institution. In most cases *D.* are supported by voluntary contributions.

Dispensatory, a medical book, which, in addition to containing the whole *Materia Medica*, or history of all the drugs and medicaments used in the practice of physic, embraces an account of the manner in which each article is prepared, with directions how to compound all prescriptions. It contains the *Materia Medica*, *Pharmacy*, and the *Pharmacopœia*, in one volume, and forms the authority and reference of every chemist, druggist, and medicine vender.

Dispenser, one who distributes or administers: usually applied to medicines.

Disponer, a person who legally transfers property from himself to another.

Dispose, to sell or get rid of; to apply to any purpose or use.

Dissect, to investigate; to cut to pieces.

Dissolution, a breaking up, as of a contract or partnership.

Distaff, an implement formerly used in spinning flax or wool, which was fastened on a staff from which the thread was drawn by the fingers. The *D.* is at present not much used, except in rude and barbarous countries; but no spinning-wheel, much less any machinery driven by water or steam, has ever produced work which can compare in delicacy with the finest products of the *D.*

Distemper. See DESTEMPER.

Distillation, a generic name for a class of chemical operations, which all agree in this, that the substance operated upon is heated in a close vessel (*retort* still), and thereby wholly or partially converted into vapor, which vapor is then condensed, by the application of cold, in another apparatus (the *condenser*) connected with the vessel, and allowed to collect in a third portion of the apparatus called a *receiver*. In most cases the substance is a liquid, or assumes the liquid form previous to emitting vapors, and the product obtained (the *distillate*) is also in greater proportion liquid. The comparatively few and special cases of *D.*, wherein solids are converted into vapors which condense directly from the gaseous into the solid form, are designated *sublimations*. Thus, we speak of the *D.* of water or of spirits, while we speak of the sublimation of sal-ammoniac. *D.* may be divided into two classes: 1st, those which are *not*, and 2nd, those which *are*, accompanied by chemical change. The word *D.*, in a narrower sense, is generally understood to apply to the first class only. The second might be called *destructive D.*, if it were not customary to reserve this term for the particular case in which the substance operated on consists of vegetable or animal matter which is being decomposed by the decomposition of heat alone, *i. e.* without the aid of reagents. The general object of simple *D.* is to separate one substance from others of different degrees of volatility with which it may be mixed. The theory and successful execution of the process assume their greatest simplicity when the substances to be separated differ so greatly in their volatility that, without appreciable error, one can be assumed to be non-volatile at the boiling point of the other. A good illustration of this special case is afforded by the customary process used for the purification of water. A natural sweet water may in general be assumed to consist of three parts: 1st, water proper, which always forms something like 98 per cent or more of the whole; 2d, non-volatile salts; 3d, gases. To obtain pure water from such material, we need only boil it in a distillation apparatus, so as to raise from it dry steam, which steam when condensed yields water contaminated only with the gases. To expel these, all that is necessary is to again boil it for a short time; the gases go off with the first portions of steam, so that the

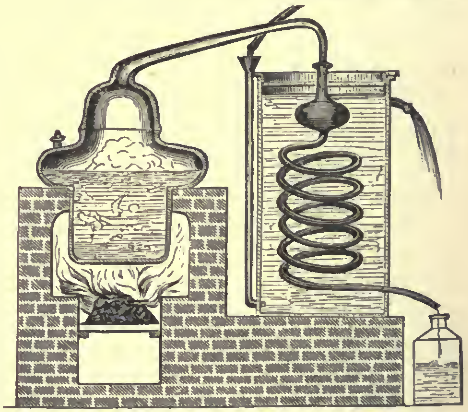


Fig 133. — COMMON DISTILLING APPARATUS.

residue, when allowed to cool in absence of air, constitutes pure water. In the *D.* of two substances of approximately equal molecular weight and latent heats of vaporization, supposing neither to predominate overwhelmingly over the other, the one with the lower boiling point will predominate in the early, and the other will gradually accumulate in the later, fractions of the distillate. And similarly with mixtures of three or more bodies. The further the respective boiling points are removed from one another the more complete a separation can be effected; but in no case is the separation perfect. It is, however, easily seen that the analytic effect of a *D.* can be increased by causing the vapor, before it reaches the condenser, to undergo *partial* condensation, when naturally the less volatile parts chiefly will run back. This artifice is largely employed by chemists, technical as well as scientific. The simplest mode is to let the vapor ascend through a long vertical tube before it reaches the condenser, and to distil so slowly that a sufficiently large fraction of the vapor originally formed fails to survive the ascent through

the cooling influence of the atmosphere. A more effective method is to let the condensed vapor accumulate in a series of small receptacles inserted between flask and condenser, constructed so that the vapor cannot pass through the receptacles without bubbling through their liquid contents, and so that the liquid in the receptacles cannot rise above a certain level, the excess flowing back into the next lower receptacle or into the still. But the most effective method is to let the vapor ascend through a slanting condenser kept by means of a bath at a certain temperature, which is controlled so that while the liquid in the flask boils rapidly, the *D.* only just progresses and no more. — As the preparation of alcoholic spirit is the most important industry in which the operation of *D.* occupies a prominent place, the establishments in which the manufacture is conducted are known as *distilleries.* But there are many other important industries in which *D.* is an essential feature, being in them employed either for the separation, purification, or concentration of various products. A large proportion of the essential oils are, for example, obtained by the *D.* of the substances containing them from water, or a mixture of salt and water. The treatment of other bodies in which *D.* plays a part will be found under their respective headings.

D. of spirits. The art of separating alcoholic spirit from fermented liquors appears to have been known in the far East from the most remote antiquity; but, notwithstanding the enormous scale on which this industry is now prosecuted, it is only in modern and comparatively recent times that it has attained to the important position which it now occupies. The preparation of ardent spirit involves two separate series of operations: 1st, the making of an alcoholic solution by means of vinous fermentation; and 2d, the concentration of the alcoholic solution so obtained by the process of *D.* and rectification. The vegetable principle, which is essential to the formation of alcohol, is *sugar;* and this is sometimes used *directly*, as where molasses and analogous saccharine products are subjected to immediate fermentation, or it is *indirectly* obtained by subjecting amylaceous grains to certain processes, by which the starch they contain is first converted into sugar, and then that sugar afterwards alcoholized. In our distilleries the latter alternative is adopted; and various kinds of grain, but chiefly corn, barley, wheat, and rye, with more or less malt, are subjected to the operation of *mashing.* For this purpose the ground grain and the bruised malt are duly mixed, and infused under constant agitation in a proper quantity of hot water in the *mash-tun;* the wort is then run off, and fresh water added, till the soluble materials of the grain are extracted. The mixed worts, or *wash*, thus obtained, is run into the fermenting vats, where, mixed with a small quantity of yeast, it is subjected to the process of fermentation, which continues from 6 to 10 or 12 days, the time required for its completion varying with the mass of liquid, and with the temperature of the atmosphere. During mashing, the starch passes into sugar, and during fermentation the sugar changes into alcohol; the consequence of which is, that the wash gradually decreases in density, or *attenuates*, and as soon as this attenuation has reached its maximum, which may be determined by the hydrometer, it should be distilled in order to prevent the commencement of acetic fermentation. — The modifications of stills or of distilling apparatus used in the preparation of alcoholic liquor are exceedingly numerous, and many of the later inventions are of most complicated structure. The simple and primitive varieties of apparatus yield only a comparatively weak spirit on the first distillation, while the effect of the complex appliances now generally used is to produce, in one operation, a highly concentrated spirit, and that with a great saving of fuel, time, and labor. All varieties of distillatory apparatus resolve themselves under these heads: 1st, stills heated and worked by the direct application of the heat of a fire; 2d, stills worked by the action of steam blown direct into the alcoholic solution from a steam-boiler; and 3d, stills heated by steam passing in coiled pipes through the alcoholic solutions to be acted upon. To the first of these classes — stills heated by direct fire — belong the earliest and simplest forms of distillatory apparatus, and for producing particular classes of alcoholic liquor, stills very simple in their construction are yet employed. The common still (Fig. 133) is a flat-bottomed, close vessel of copper, with a high head to prevent the fluid within from boiling over. To the top of this head a tube is connected, which is carried in a spiral form round the inside of a tub or barrel (the condenser or refrigerator), filled with cold water, and from its twisted form this tube receives the name of the *worm.* The tube terminates at the bottom of the barrel, passing through it to the outside, and is conducted into the vessel termed the receiver, a stop-cock, or more commonly a vessel termed a *safe*, being usually placed on the tube where it leaves the refrigerator. In distilling with an apparatus of this simple construction, it is obvious that at the beginning of the operation, when the wash or liquid to be distilled is rich in alcohol, and its boiling point consequently low, the distillate will pass over at a low temperature and contain a high percentage of alcohol. But as the operation progresses, the boiling point of the mixture in the still rises; the heat has therefore to be forced, and the quantity of watery vapor which passes over with the alcohol is proportionately increased. As the wash or liquid in the still continually weakens, a point is arrived at when the value of the weak distillate produced will not balance the expenditure on fuel for maintaining the heat of *D.* One of the earliest devices for economizing the heat of *D.* consisted in interposing between the still and the refrigerator a wash-warmer, or vessel charged with liquid ready for *D.* Through this vessel the pipe conveying the hot vapors to the refrigerator coil passed, and the vapors, partly condensing there, heated up the wash, which was thus prepared to pass into the still at an elevated temperature. The *pot* stills, in which the markedly flavored Irish whiskey is made, are of this construction. In large establishments, simple stills, of a capacity of 20,000 gallons, are erected having a rousing apparatus within them to keep the wash in agitation so as to prevent solid particles from settling on the bottom and burning. Beyond a wash-warmer, or intermediate charger interposed between the still and the condenser, there is no other appliance attached to the apparatus. The first distillate from the still is termed "low wines," and passes into the "low wines receiver," whence it passes into No. 1 "low wine still" to undergo a second distillation. The product of the second distillation, under the name of "faints or feints," is caught in the "faints receiver," from which it passes to No. 2 low wines still, and from this it is discharged as Irish whiskey. — The introduction of another principle into distillatory apparatus is illustrated by Dorn's still, which was introduced into Germany in the early part of the century, and is yet much used in smaller establishments in that country. In that apparatus, the vessel of copper interposed between the still and the condenser is divided horizontally into two unequal compartments by a diaphragm of copper. The upper and larger portion acts as a wash-warmer (Ger. *Vorwärmer*), and through it the pipe from the still body coils,

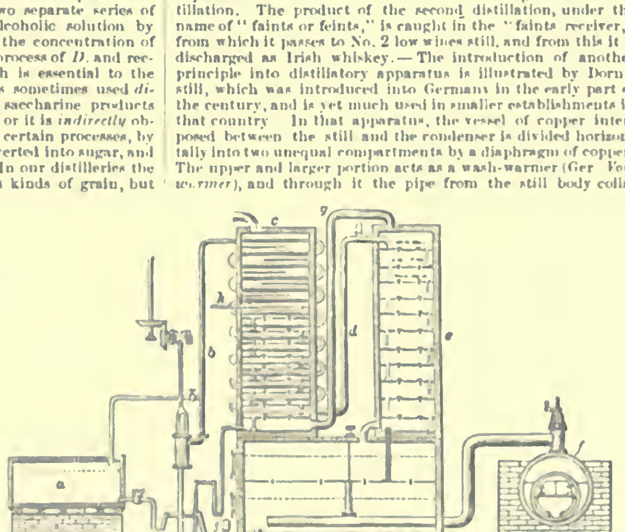


Fig. 134. — Coffey's Still.

opening into the lower division. For a time the whole distillate condenses in this division, but as the temperature of the wash in the upper division rises, and the heat of the more watery distillate from the still also increases, the condensed liquor in the lower division in its turn begins to boil, and undergoes a second distillation or rectification, the vapors from it passing onwards to be condensed in the ordinary refrigerator. In many forms of distillatory apparatus two or more such rectifiers are placed between the primary still and the final condenser. The principle of the rectifier is easily understood. Supposing the operation of distilling to commence, the vapors which condense in rectifier No. 1 are much richer in alcohol than the liquid remaining in the still. The boiling point of the condensed liquid is consequently proportionately lower, and the vapor from the still passing into it gradually raises it to the boiling point, so that in its turn rectifier No. 1 distils into rectifier No. 2 a liquid of still higher alcoholic richness.

The relation of No 2 to No. 1 is the same as that of No 1 to the still body, and thus the concentration and redistillation might be carried on to any practicable or desired extent — Another principle brought into play in complex stills for the separation of stronger from weaker alcoholic solutions consists of dephlegmation, or the submitting of the vapor to a temperature so regulated that a portion of it, and that, of course. the most watery, is condensed and separated, running back into the still or into a special vessel, whilst the richly alcoholic vapor passes on to the rectifier or condenser. In Dorn's still the wide and lofty head attached acts as a dephlegmator, watery vapors condensing on it, and thence falling back into the body; but in the more recent forms of apparatus, such as those of Pistorius and Siemens, special dephlegmators of an elaborate nature are introduced. — Of the second class of stills, — those in which the operation is conducted by the heat of steam generated in a boiler, and forced into the apparatus, — the Coffey still may be taken as an example It is the form most frequently adopted in Great Britain for the manufacture of "silent" spirit, and it is generally recognized as the best and most economical device for preparing a highly concentrated spirit in a single operation. The Coffey still may further be regarded as a type of continuous distilling apparatus. as in it the necessity for withdrawing exhausted solutions and recharging the still with fresh wash is avoided Beginning, as the Coffey still does, with the steam of pure water, the principle of rectification formerly alluded to is here carried out from the first step The watery vapor becomes more and more highly charged with alcoholic fumes, till in the end the strongest spirit falls, condensed, into the receiver In Coffey's apparatus, the saccharine solution, or *wash*, is pumped from the wash-charger, *a*, through the pipe, *b*, into the worm-tube, which passes from top to bottom of the *rectifier*, *c*; in circulating through this tube its temperature is somewhat raised, and on arriving at the bottom it passes through the pipe, *d*, in at the top of the *analyzer*, *e*. Here it falls successively from one to another of a series of shelves, perforated, and having valves for the entry of steam from the boiler, *f*, by which they are heated As the wash gradually descends in the analyzer, it becomes rapidly weaker, partly from condensation of the steam which passes into it, and partly from the loss of alcohol either evaporated or expelled by the steam, till when it arrives at the bottom it has parted with all its spirit At the same time, the vapor as it rises through each shelf of the analyzer becomes richer in alcohol. On arriving at the top it passes through the pipe, *g*, in at the bottom of the rectifier; here it ascends in a similar way through the descending wash, until it arrives at *h*, above which it merely circulates around the upper convolutions of the wash-pipe, the low temperature of which condenses the spirit, which, collecting on a shelf, flows off by a tube into the finished-spirit condenser, and is finally conveyed to the receiver — In order to economize heat, the water-supply pipe of the boiler is of spiral form, and is immersed in a trough which receives the boiling hot spent wash. — Flat-bottomed and fire-heated stills are considered the best for the *D.* of malt spirit, as by them the flavor is preserved. Coffey's still, on the other hand, is the best for the *D.* of grain spirit, as by it a spirit is obtained almost entirely destitute of flavor, and of a strength varying from 55 to 70 over proof Spirit produced of this high strength evaporates at such a low temperature that scarcely any of the volatile oils on which the peculiar flavor of spirits depends are evaporated with it, hence the reason why it is not adapted for the *D.* of malt whiskey, which requires a certain amount of these oils to give it its requisite flavor. The spirit produced by Coffey's still is, therefore, chiefly used for making gin and factitious brandy by the rectifiers, or for being mixed with malt whiskeys by the wholesale dealers.

Distiller, a manufacturer or preparer of spirits, one who distils from malt, or prepares perfumes; a rectifier and compounder.

Distillery, a building in which distillation and the rectification of spirits is carried on. The Internal Revenue Laws of the U. States, laying down the regulations to be followed by the distillers in the manufacture of spirits, are given in this work under SPIRITS.

Distinguishing Pennant, the special flag of a ship, or a particular pennant hoisted to call attention to signals.

Distribution, in printing, the breaking up of a form, or page, etc., of type; and replacing the letters in their proper cells in the compositor's cases.

Ditch, a trench in the earth made by digging.

Ditto, a word derived from the Italian word *detto* (that which has been said), and used in accounts to avoid repetition. It is commonly abbreviated into *Do.*

Diuretics, medicines which operate by increasing the discharge of urine.

Dividend, the commercial name for the interest allowed on government stocks, foreign bonds, and various other public securities, which are usually payable half-yearly. *D.* is also the proportionate payment made to creditors out of the estate of a bankrupt, and the profits received by stock and shareholders in joint-stock companies at stated periods. — *Ex div.* is a Stock Exchange abbreviation, implying that a security is dealt in without the dividend due or accruing.

Dividend Warrant, an order or authority upon which shareholders or stockholders receive their half-yearly interest.

Divi-Divi, the commercial name of the pod of the *Cæsalpinia coriaria*, a leguminous plant found in low, marshy situations in the N. parts of S. America, principally in the U. States of Colombia and Venezuela, and in some parts of the West Indies. It is used both for dyeing and tanning, but chiefly for the latter purpose. The pod is from 2 to 3 inches in length by ¾ inch in breadth, and when in perfection is of a rich brown color. It contains a few small seeds, but the only valuable portion is a resinous matter of a bright yellow color, easily pulverized, which lies betwixt the outer skin and the husk that encloses the seed, and contains a large quantity of tannin. *D.* is used by dyers, not for the coloring principle which it contains, but for its strong astringent qualities as a mordant. For this purpose it is at present used to some extent instead of sumac, which is scarce and dear. In tanning it accelerates the process, and imparts to the leather a clean and healthy appearance. *Imp.* free.

Diving. The art of *D.* to considerable depths under water to bring up pearls, corals, and sponges,

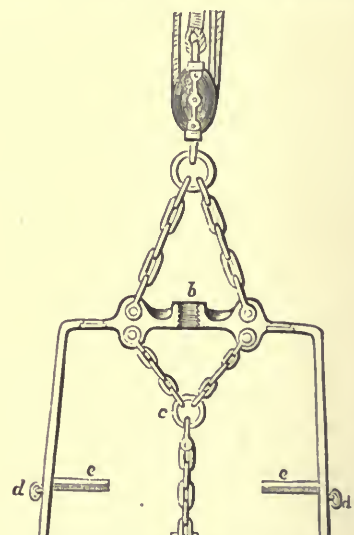


Fig. 135. — SECTION OF DIVING-BELL.

has been practised in the Indian seas from very early times. It is obvious, however, that, not having the aid of any artificial appliances for supplying air, the powers of early divers, both as regards the depth to which they could descend and the length of time they could remain submerged, were comparatively limited. At an early

period, therefore, the attention of philosophers and mechanics was turned to the discovery of a contrivance for aiding the diver in prosecuting his daring but useful calling, which was rendered all the more important from its being no longer confined to the acquisition of Eastern luxuries, but to the raising of treasure from sunken vessels. It is not considered expedient to occupy space by reference to the feats of the early or modern divers, but rather to pass at once to the description of the *D.* apparatus of modern times, as illustrated by the *D.*-Bell and the *D.*-Dress at present in use. And here it may be stated that, in addition to the sponge and coral trade of foreign lands, which has been greatly advanced by the use of modern appliances, there are the works of the naval engineer, and more particularly of the civil engineer, in which *D.* apparatus is so extensively employed and so essentially necessary as to place the art of *D.* on a wider basis, and to give it an importance only fully developed during the present century.

D.-Bell. The most useful of ancient contrivances is the *D.*-bell, which, first mentioned in Europe in the works of John Taisnier (born 1509), and gradually improved, is now the well-known apparatus used by engineers in the present day. The conception of the *D.*-bell is very simple. The air contained in an inverted jar sunk in a vessel of water excludes the water from the interior, and if the vessel be made of sufficient size to contain persons within it, it may be sunk without their being wetted, and they may continue to be submerged so long as the air within the bell continues pure enough to support animation. Such were the "*D.*-chests" of the first makers, which, though they differed in form and details, were constructed on the same principle as the modern bell, and were generally formed of wood, girded with iron hoops, like a barrel. A section of the bell as now used is shown in Fig. 135. It is a cast-iron chest weighing about 5 tons, and is suspended by block and tackle. On the top of the bell there are 8 apertures, fitted with very thick glass for admitting light; and in the centre is the passage, *b*, into which the hose is screwed for admitting the air supplied. The interior is fitted with two seats, *e*, which can be removed to make room when the men are at work; and in the centre is a lifting chain, *c*, to which stones are attached to facilitate their being lifted and properly adjusted to the beds on which they are to be laid. The bell is used according to two different systems, depending on the nature of the work to be performed. In building masonry under water it is suspended from a staging of timber; but in excavating rock or removing boulders, scattered over a considerable area, where a staging would be inapplicable, it is suspended from a barge or lighter. Fig. 136 shows the arrangement as employed in laying stones or blocks of concrete. It represents a cross section of the staging, bell-framing, and bell-carriage, in which *a* is the staging, *b*, longitudinal beams on which the bell-framing, *c c*, traverses on the wheels and toothed racks, *d*. The *D.*-bell, *e*, is suspended from the bell-carriage, *f*, which traverses on the bell-framing by the wheels and toothed rack, *g*, across the whole breadth of the pier. The stones, *h*, are brought along the surface of the finished part of the pier, and lowered down by the travelling crab-winch, *l*. The force-pumps by which the bell is supplied with air are shown at *m*, and the air-hose at *n*. It will be understood, from this description, that the bell-framing, *c*, moves freely *along* the staging, while the bell-carriage has a motion at right angles across the work, so that the position of the bell can be altered with the greatest ease so as to bring it over any spot within the area of the staging. In proceeding to work, the men take their seats in the bell from a boat, and the bell is then lowered to the required depth. If the work be that of building a wall, a stone is lowered at the same time. The changes in the position of the bell are all made according to signs given by the divers by strokes of a hammer on the bell, which experience has shown can be heard at any depth at which the *D.*-bell has been employed. These signals are narrowly observed by a watchman stationed in a boat, and reported to the men working the bell-carriage. The rule for the supply of air both of the bell and *D.*-dress is to give it so freely that there shall be a constant escape of air rising to the surface in air-bubbles all the time the men are under water. After being lowered, the bell is first moved over the stone to be laid; the divers then unhook the lowering chain from the lewis in the stone, and at the same time make fast the stone to the tackle within the bell, which is at once signalled to be raised, and carries the stone with it. The bell is then moved over the site on which it is to be placed; it is then lowered until it has nearly reached its bed, on which it is finally deposited. The lewis is then removed, and the bell raised for another stone; and with trained workmen it is surprising how expeditiously the bell is moved from place to place, and stone after stone is built in the walls. The staff of men required to work the bell is two divers, one watchman, four men working the air-pump, and four working the bell-carriage, besides the men required to bring forward and send down the stones. The men engaged generally work in shifts of from 3 to 6 hours according to the depth, and the *D.* work may be continued as long as in ordinary day-work, as in clear water the light is good to the greatest depth at which the bell is used in harbor building.—When engaged in blasting, the bore is made in the ordinary way, and charged with a shot enclosed in a water-tight canvas case, to which is attached a length of 6 or 8 feet of patent fuse. The bell is then moved from above the bore, and the fuse ignited, and when the shot is fired the smoke rises to the surface clear of the bell.

D.-Dress is peculiarly well fitted for such works as the repair or overhaul of rollers and sluices of lock gates, cleaning or repairing ships' bottoms, and, in short, everything that cannot be done from the interior of a bell. The inexpensiveness also of the *D.*-dress, dispensing with all costly staging, and its ease of transport and appliance, are much in favor of its use. The invention of the *D.*-dress, like that of most useful appliances,

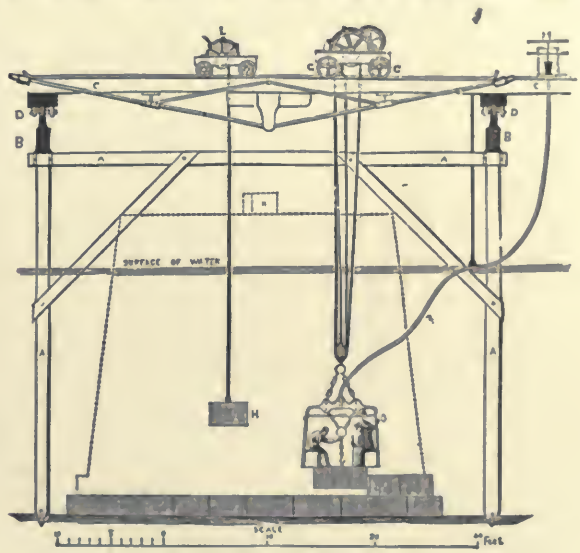


Fig. 136.—Block-Laying by Diving-Bell.

was gradual, and the work of many minds. The long-continued experience gained in *D.* during the first half of this century had a great effect in bringing the *D.*-dress to its present perfection. The *D.*-dress, as will be understood from Fig. 137, envelops the whole body of the diver, the upper portion, *a*, being the "helmet," the intermediate portion, *b*, the "breastplate," and the lower portion, *c*, the "dress." The hose by which the air is supplied is shown at *d*, and *e* is the "life" or "signal" line, which is attached to the diver's waist, and by which he makes signals and is hauled to the surface. The waterproof material of which the dress is made is very generally sheet india-rubber, covered on both sides with tanned twill to protect the india-rubber from injury. The cuffs fit tightly round the wrists, leaving the hands free, and india-rubber bands slipped over them render the joint water-tight. The breastplate, *b*, is made of tinned copper with an outer edge of brass, which has screws fitted to it projecting upwards and passing through corresponding holes in the collar of the dress. On the top of this, and with holes in it corresponding to the screws, four pieces of a metal band are firmly screwed down by wing nuts, nipping the soft material of the collar between the metal of the breastplate and band, and thus insuring a water-tight joint. On the front of the breastplate two studs are fastened for securing the back and front weights, *g*. Some makers put a valve, *h*, on the front of the breastplate, by means of which the diver can regulate the pressure inside his dress at will, and in this way has the power, by simply inflating

his dress more or less, of making himself of any specific gravity, so as to float at any desired depth or rise to the surface without the assistance of the attendant. This arrangement in the hands of a skilled diver is undoubtedly a great convenience. But it is still a matter of difference of opinion whether it is not safer to trust to being hauled up by the watchman on the surface, whose duty it is to hold the *life* or *signal* line in one hand, and the air-hose in the other, while the diver is at work, and to attend to whatever signal he may give by pulling the life-line. The inconvenience of the air bubbling up in front of the bulls' eyes, and the danger of inexperienced divers becoming giddy and turning the valve the wrong way, have induced some makers to do away with this useful valve, and to substitute at the back of the helmet a valve which the diver can regulate by the pressure of his hand, but which rights itself the moment his hand is removed. The neck of the breastplate is fitted with a "segmental screw bayonet joint," and to this the helmet, the neck of which is fitted with a corresponding screw, can be attached or removed by one eighth of a turn. The helmet is made of tinned copper, and fitted in front with three strong plate-glass windows, or bulls' eyes, in brass frames protected with guards. Sliding covers have been introduced to draw over these windows in case of their getting broken. The front eyepiece is made so that it can be unscrewed, and in this way the diver on ascending can rest himself for a short time or give orders without removing the rest of his dress. Some manufacturers have introduced instead of this a hinged glazed frame, which fits tightly into a conical vulcanized india-rubber seat like the ordinary port-hole of a ship, so that it can be opened by the diver himself the moment his head is above water, and being attached to the helmet it cannot be dropped accidentally into the sea or otherwise mislaid. An outlet valve, *a*, is fixed at the back of the helmet, which, opening outwards, permits the escape of the foul air but prevents the entrance of water. The inlet valve, *b*, to which the hose is attached, is also fixed at the back of the helmet, and is so constructed as freely to admit the air from the force-pump; but should anything occur to the hose or pumps the valve at once shuts, enclosing a sufficient supply of air in the dress to support the diver till he can be hauled to the surface. The air, after entering by the inlet valve, is conducted in tubes, *c*, to the front of the helmet, so that the diver has the advantage of inhaling fresh air, and the front glasses are kept free from the condensation of his breath, which would otherwise take place. On each side of the helmet is a hook over which the cords pass which carry the front and back weights, and a brass stud to one of which the life-line, and to the other the air-tube, are attached; *d d* is the joint by which the helmet is screwed upon the breastplate. The back and front weights weigh about 40 lbs. each, and are held close to the diver's body by means of a lashing passing under his armpits. The boots are made of stout leather, with leaden soles, secured by two buckles and straps, each boot weighing about 20 lbs. The cost of a *D.*-dress, with all its appliances, is about $700. — At moderate depths, not exceeding 30 to 40 feet, and with clear water, sufficient light is transmitted to enable the diver to perform any ordinary work, and in working in turbid water with the *D.*-bell candles are employed. An electric lamp and an oil lamp are employed when light requires to be used by divers at great depths. Captain Eads states that at the St. Louis Bridge, built across the Mississippi in 1870, candles were at first employed, which, under a pressure of 100 feet, were found to be burnt down in about three fifths of the time required in the open air; under a pressure of 80 feet it was found that a candle, if blown out by the breath, would immediately re-ignite; and at the depth of 108½ feet a candle was blown out thirteen consecutive times in the course of half a minute, and each time excepting the last was re-ignited. The depth at which *D.* can be safely conducted is a question of importance. The ordinary depth at which the *D.*-bell has been employed in harbor works is from 30 to 35 feet, and it has been used in 60 feet at Dover, in England. With the *D.*-dress much greater depths have been attained; and it is related that in removing the cargo of the ship "Cape Horn," wrecked off the coast of South America, a diver named Hooper made seven descents to a depth of 201 feet, and at one time remained 42 minutes, supposed to be the greatest *D.* feat ever achieved. The practice of *D.* obliges the diver to conduct his work under a pressure greater than that of the atmosphere at the surface of the earth. All diving work is done under an abnormal atmospheric pressure, which increases with the depth at which the diver is submerged in water. This pressure, when he is submerged to the depth of 33 feet, is twice that of the normal surperficial atmospheric pressure. At greater depths the pressure is proportionately increased, and ultimately becomes so great that life could not be maintained. To descend even to the moderate depth of 30 or 40 feet, which is about the maximum required for ordinary engineering sea-works, demands some practice and nerve on the part of the diver; but when greater depths have to be explored, in raising sunken vessels, for example, the energy and power of endurance of the diver are much more severely taxed. The sensations experienced in a *D.*-bell are common, it is believed, to all divers. Very soon after the lips of the bell have touched the surface of the water pain is felt in the ears and above the eyes, which continues with greater or less intensity according to the rate of descent until the bell has attained the bottom. So long as the bell continues *there* no pain is felt, the only feeling being that of depression due to the depth to which the diver is submerged. As soon as the upward movement commences the pain in the ears and above the eyes returns, and continues till the surface is reached. The motion of the bell is very gradual, sometimes not exceeding 3 feet per minute, but even at that slow rate the head does not accommodate itself to the increase of pressure so as to avoid inconvenience. Aeronauts do not suffer to the same extent in their ascents in balloons, because the alteration of pressure is much more gradual in passing through the atmosphere than through a medium having the density of water. The greatest pressures to which men are subjected in engineering works are experienced in the compressed-air cylinders used in bridge building. Captain Eads, the engineer of the St. Louis Bridge, gives some interesting information, in his reports to the directors of the Illinois and St. Louis Bridge Company, on the effect of working under high pressure on the men. The maximum depth to which the cylinders had to be sunk was 110½ feet below summer water-level, and the greatest pressure under which the men worked was 50 or 51 lbs. on the square inch. When the depth of 60 feet had been reached some of the men were affected by paralysis of the lower limbs, which usually passed off in a day or two. At greater depths the symptoms were more severe. The duration of working in the air chamber was gradually shortened from four hours to one hour. The total number of men employed in working under pressure was 352, of whom 30 were seriously affected and 12 cases proved fatal.

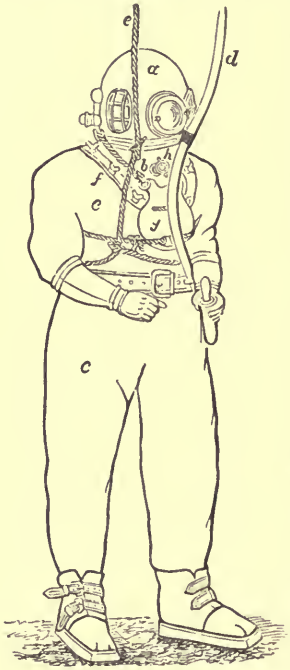


Fig. 137. — Diving-Dress.

Djidda. See Jiddah.

Djung, a large superficial measure for land in the Eastern Archipelago, equal to four bahus, or about 284 acres.

Do. See Ditto.

Dock, an artificial enclosure or basin for the reception of ships.

Wet D. are generally constructed with gates to retain the water. Ships are admitted at high water; and the gates being shut, they are kept constantly afloat. "In ports where vessels would be naturally much exposed during rough weather, or where the changes in the tide are very great, the necessity of secure and well-sheltered docks, or artificial basins, in which ships may be safely moored and kept at one level, is especially manifest. In the northern parts of Europe the rise and fall of the tides are so great that every port which has any pretensions to a first-class mercantile harbor is necessarily supplied with one or more wet *D.*; at most of the ports of England, and especially at those of Liverpool and London, *D.* have been constructed on a truly magnificent scale. In many ports throughout the world — such, for example, as that of New York, where the harbor is naturally protected, and as also in the Mediterranean, where the rise and fall of the tides is so small as not to obstruct the loading and unloading of ships — wet *D.* are not an absolute necessity

to commerce, though there is no doubt that the excellent appendages which are attached to them, such as the wharf-room, the magnificent quays and warehouses, the railway connections, cranes, etc., of the *D.* of Liverpool and London, and, by no means least of all, the excellent police arrangements for effecting order and safety from fire and depredation, would most certainly greatly promote the commercial prosperity of any port." — *Johnson's Encyclopedia.*

Dry D. are intended for the building, repairing, or examination of ships. The ships to be examined or repaired are admitted into it at high water; and the water either ebbs out with the receding tide, or is pumped out after the gates are shut. Ships may also be conveniently built in dry *D.*, and floated out by opening the gates; though in all dockyards there are places set apart for this purpose under the name of *slips.* Dry *D.* are of two kinds, — the *stationary dry D.*, generally called *graving D.*, and the *floating D.*

Graving D. It requires to be perfectly water-tight, and demands the greatest care in its construction. It is sometimes lined all around with wood, but more generally with masonry, mostly of hewn granite. The expense is very considerable, as the foundation, by means of piles or otherwise, must be well secured, all leakage prevented, and the culvers or drains properly constructed, to let in and carry off the water without its undermining the quays or piers. A graving *D.* may be *single*,

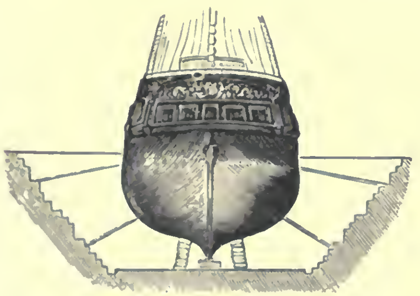


Fig. 138. — Graving Dock.

or made to contain only one ship; or *double*, to contain two ships; but the former is the most common, because more convenient. The entrance is closed by gates, which open sideways, like a lock or fall, upon the bed of the entrance, or by caissons. The vessel is floated into the dock at high water, the gates closed, the sluices opened, and the water allowed to run out, or is pumped out, leaving the dock perfectly dry; the vessel (Fig. 138) being supported on timber struts and shores resting upon the steps already mentioned as forming the sides of the dock. The naval dry *D.* of the U. States are among the most stupendous mechanical enterprises of the country; they are constructed at the navy-yards of New York, Charlestown, Norfolk, etc. By far the most extensive and magnificent of these structures is the granite graving *D.* at Brooklyn; 80,000 tons of stone were used in its construction; the masonry foundations are 400 feet in length and 120 in breadth. The main chamber is 286 feet long, and 30 feet broad on the bottom; 307 feet long, and 98 feet broad at the top within the folding gates; the height of the wall is 36 feet. The work was commenced in 1841, and took 10 years to complete it; the aggregate expenditure was above $2,100,000. The naval graving *D.*, at Boston, built of granite, and completed in 1833, is 253 feet in length and 86 feet in width inside the chamber; the turning-gates and the caisson are of timber and composition fastened with copper bolts; the caisson being 60 feet in length, 30 feet in height, and 16 feet in width amidships. The total cost of this *D.* was about $700,000.

Floating D. Of the several varieties of this *D.* we will mention the following: The *Sectional D.*, intended to lift a vessel above the surface of the water, in order that its bottom may be cleaned. It consists of a series of caissons connected with a platform, which is introduced below the vessel, and, the water being pumped from these caissons by means of steam-engines, the vessel is raised by their flotation. The apparatus is towed to any place where it is necessary to apply it. The sectional *D.* in the Philadelphia navy-yard is made in nine separate and independent sections, differing only in their widths. Each section consists of a pontoon or tank, water-tight, 105 feet in length, 30 or 32 feet in width, and 11 feet in depth; two end-frames, and two end-floats. Together, the sections form a floor of over 300 feet in length and 105 feet in width. At each end of each section is an open frame in which is a float connected with the four posts of the framework, which is raised and lowered by machinery, — raised to assist in sinking the main tank to the depth required, or lowered into the water to give it greater buoyancy. — The *Balance D.*, like the preceding, is constructed of timber, and consists of a pontoon bottom with two side walls, possessing sufficient displacement to carry the whole weight of the dock and the vessel to be raised. The side walls are hollow and of considerable width, serving, like the floats in the sectional dock, to preserve its stability in rising and sinking. The outside of these walls is vertical, while the inside is sloping, so as to conform to a certain extent to the shape of the ship. Port-holes are made in the walls for ventilation. The walls also afford the means of shoring up the ship, as in a stone *D.*; on the top are the engine-house, pumps, and working platform. There are sometimes gates at the ends for enclosing the *D.*, which are used only when vessels of great weight are to be lifted. Of this description is the Portsmouth navy-yard *D.*, which is 350 feet in length, 38 feet in depth, and 90 feet in inside width. This *D.*, with the basin and railways, cost $733,000. The Pensacola *D.*, which is similar, cost $923,000. There are also balance *D.* at New York, Charleston, Savannah, Mobile, and New Orleans. — The *Hydraulic D.* is an apparatus by which the vessel to be repaired is brought over a platform which is slung between the frames, being suspended by the requisite number of chains, say 20 on each side, which pass over cast-iron pulleys supported on the top of the wooden framework. The lower ends of the chains are fixed to the platform, and the upper ends to a horizontal beam of wood, which is attached by means of a cross-head to the ram of an hydraulic engine. When the ram, therefore, which is placed in a horizontal position, is moved, by the injection of water into the cast-iron cylinder in which it works, the motion is communicated to the horizontal beam, and thence, by the suspending chains, to the platform bearing the vessel, which is thus slowly raised to the surface. The fixtures of the cylinder are embedded in a large mass of masonry, so as to render it quite immovable. There are several racks attached to the apparatus, for supporting the platform, and taking part of the weight off the ram after the

vessel is suspended. When she is ready to be lowered, these racks are unshipped, and the water being permitted to escape through a small aperture provided in the cylinder for that purpose, the vessel slowly descends into the water. The perpendicular *lift* of one of these *D.* in New York Harbor is ten feet. *Summary accounts of the most important foreign D. are given under the names of the ports to which they belong.*

Docket, to label. — A memorandum affixed to papers implying their meaning. — A ticket attached to goods specifying their measurement; also what is tied or fastened to a bundle, as a direction where to deliver it. — To strike a docket is a term frequently used in England for entering a declaration of bankruptcy against a person.

Dock-Master, in England, a resident officer who has the superintendence of docks.

Dock-Rent, charges for storing and warehousing goods in a dock.

Dock-Warehouses are bonded warehouses within the docks of London, Liverpool, etc.

Dock-Yard, in Great Britain, a private or government yard, near a harbor or roadstead, where naval stores are kept, and ships built and repaired.

Doctor, a medical man holding the degree of M. D. — The scraper in a print-machine which cleanses the surplus color from the surface of the engraving cylinder. — Generally a part in a machine for regulating quantity, adjusting, or feeding.

Doctoring, a term applied to injuring or adultering. as *D.* seed, horses, etc. — The operation of removing with a scraper the excess of color from the cylinder in calico-printing.

Document, an official or authoritative paper containing instructions or proof for information, and the establishment of facts.

Document-Bill, an Indian bill of exchange drawn on London, having as collateral security the bill of lading and policy of insurance on the goods; against a part of the estimated value of these the bill is drawn.

Doer, a Scotch name for an attorney, manager, or steward; synonymous with factor.

Doeskin, a woollen cloth for trousers. — A name for deer-skin prepared for gloves.

Doffer, a comb or revolving card-covered cylinder in a carding-machine, which strips the fleece or sliver of fibre off the main card-wheel after the filaments have passed the series of smaller carding-rollers and the flat cards.

Dog [Fr. *chien;* Ger. *Hund;* It. *cane;* Latin, *canis familiaris*], a well-known quadruped, varying greatly in stature, form, color, and the quality of the hair. Its period of gestation is 63 days, and the whelps, which often number 8 or 9, are born blind, and do not see till after the lapse of 10 or 11 days. The growth of the animal is complete at two years; at the expiration of 5 years it is considered old, and the limits of its existence rarely exceed twenty years. No trace of the dog is to be found in a primitive state of nature; and its parent stock is by many supposed to be the jackal or wolf, particularly the last, to which in many respects it has a strong affinity. "The dog exhibits," says Cuvier, "the most singular, the most complete, and the most useful conquest that man has made. The whole species is become our property; each individual is entirely devoted to his master, adopts his manners, distinguishes and defends his property, and remains attached to him even unto death; and all this springs not from mere necessity, not from constraint, but simply from *reconnaissance* and a true friendship. The swiftness, the strength, and the highly developed power of smelling of the dog, have made him a powerful ally of man against the other animals, and were perhaps necessary to the establishment of society. It is the only animal that has followed man over all the earth." This account, however, applies solely to the animal as it exists in Europe and America. By Mohammedans and Hindoos it is regarded as impure, and neither will touch one without an ablution; they are, therefore, unappropriated, and prowl about the towns and villages, devouring the offal, thus performing the office of scavengers. In China, Cochin-China, the Society Islands, and other places, it is used as food, and puppies are considered a great delicacy.

In machinery this name is applied to any device with a tooth which penetrates, or grips an object and detains it; a hold-fast.

Doganiere, a custom-house officer in Italy.

Dog-Cart, a sporting carriage with a box for carrying pointers; also a light jaunting-car.

Dogfish, a name applied to several species of the smaller sharks. Their body is round and tapering, the snout projects, and the mouth is placed far under. There are two dorsal fins, each of which is armed on its anterior edge with a sharp and slightly curved spine. Their size varies from 30 inches to 5 feet. They are very prolific, the female producing young almost daily for 9 or 10 months in the year. These are not contained in egg cases, as in the ground-sharks, but are produced alive. The common *D.* (*Acanthius vulgaris*), is abundant along the New England coasts, and is the special enemy of the fisherman, injuring nets, removing the hooks from his lines, and spoiling his fish for the market by biting pieces out of them as they hang to his lines. They are, however, caught in great numbers for the excellent oil their livers yield. The rough skin of the *D.* is used for polishing wood and other substances.

Dogger, a two-masted Dutch fishing-vessel, resembling a ketch, often fitted with a well for fish.

Dog-Shores, short pieces of timber fitted to the upper end of the bilgeways on a building-slip, which are knocked away to facilitate the sliding or launching of a vessel.

Dog-Skin, gloves, etc., are made of the skin of the dog. *Dog-skin gloves* is the trade-mark, in New York, for a superior kind of sheep-skin gloves.

Dog-Stones, rough, shaped, or hewn pieces of stone used to make millstones.

Dog-Vane, a small vane on the mast-head to show the direction of the wind.

Dog-Watch, a short watch, or spell of duty on shipboard, of only two hours.

Dogwood, the wood of *Cornus Florida*, a deciduous American tree. It is hard, compact, heavy, and fine-grained, and is susceptible of a brilliant polish, from which circumstance it may be substituted for numerous purposes to which boxwood is applied. The sap-wood is perfectly white, and the heart-wood is of the color of chocolate. In the U. States it enters into the construction of many articles, both for utility and ornament, such as the handles of light tools, mallets, toys, etc. It is sometimes used by farmers for harrow-teeth, for the hames of horse-collars, and also for shoeing the runners of sleds; but to whatever purpose it is applied, being liable to split, it should never be wrought till it is perfectly seasoned. The shoots, when three or four years old, are found suitable

for the light hoops of small casks, and in the Middle States the cogs of mill-wheels are made of them, and the forked branches are coverted into the yokes which are put upon the necks of swine, to prevent them from breaking into enclosed fields. In the parts of the country where it abounds, it serves for excellent fuel. The inner bark of this tree is extremely bitter, and is used as a good substitute for the Peruvian bark. The bark also may be substituted for galls in the manufacture of ink, and from the bark of more fibrous roots the American Indians obtain a scarlet dye. An infusion of the flowers of this tree is also used by them in the cure of intermittents. The fruit is sometimes taken as a tonic, in the form of a spirituous impregnation, and it likewise forms a favorite repast for various species of birds.

Doley, a division of the Russian pound, 96 doleys making 1 zolotnick, and 96 zolotnicks 1 Russian pound: 10 Russian pounds are equal to about 9¼ English pounds.

Doll [Fr. *poupée;* Ger. *Puppe*], a toy of wax, wood, or plaster, made like the image of a child, and used as a plaything. They are chiefly manufactured in Nuremberg, Germany. *Imp.* duty, 35 per cent. Doll's wardrobes and toilet articles are held dutiable as toys: 50 per cent.

Dollar [Ger. *Thaler;* Danish, *daler;* from the Anglo-Saxon *dal*, Ger. *Thal*, a valley, the coin being said to have been first struck in the *dale* or valley of Joachim, Bohemia, in 1518], a silver and gold coin and the money unit of the U. States, its value being 100 cents, or the 10th part of an eagle. Its value was originally the same as that of the old Spanish *D.* or piastre, but is now somewhat below. The origin of the *D.*-mark, or sign $, is not known. It is asserted that it is a contraction for U. S.; and by placing the letter S over the letter U, a very fair $ mark is produced. It has also been asserted that the columns or pillars on the old pillar *D.*, which were connected by a scroll, bear such a resemblance to the $ mark as to account for its origin. But the more probable opinion is that it is merely a modification of the figure 8, intended for 8 reals or "a piece of 8." — It was coined in silver only until 1849, when the coinage of gold *D.* was authorized. By act of Feb. 28, 1878, the silver *D.* is legal tender for all debts, public and private, except when otherwise expressly stipulated in the contract. The half-*D.*, quarter-*D.*, twenty-cent piece, and dime are legal tender for twenty *D.* only. The market value of the silver in the *D.*, which was 93¼ cents in gold coin when the act of Feb. 28, 1878, was passed, is now only about 86 cents in gold coin.

The authority for coining D. and subdivisions changes in weight and fineness, and total amount coined to close of fiscal year ended June 30, 1878, are as follows: —

Gold D., authorized to be coined, act of March 3, 1849; weight, 25.8 grains; fineness, 900; total amount coined, $19,-846,158.

Gold three-D piece, authorized to be coined, act of Feb. 21, 1853; weight, 77.4 grains; fineness, 900; total amount coined, $1,708,932.

Silver D., authorized to be coined, act of April 2, 1792; weight, 416 grains; fineness, 892.4. By act of Jan. 18, 1837, weight was changed to 412½ grains, and fineness to 900. Coinage discontinued, act of Feb 12, 1873; total amount coined, $8,045,838. Coinage reauthorized, act of Feb. 28, 1878; amount coined since the passage of this act (4 months), $8,573,500.

Trade D. (silver), authorized to be coined, act of Feb. 12, 1873; weight, 420 grains; fineness, 900; total amount coined, $35,959,360.

Half-D., authorized to be coined, act of April 2, 1792; weight, 208 grains; fineness, 892.4 By act of Jan. 18, 1837, weight changed to 206¼ grains, and fineness to 900 Weight changed to 192 grains by act of Feb. 21, 1853; and to 12½ grams, or 192.9 grains, by act of Feb. 12, 1873. Total amount coined, $122,744,795.50.

Quarter-D., authorized to be coined, act of April 2, 1792; weight, 104 grains; fineness, 892.4. By act of Jan 18, 1837, weight changed to 103⅛ grains, and fineness to 900. Weight changed to 96 grains by act of Feb. 21, 1853, and to 6¼ grams, or 96.45 grains, by act of Feb. 12, 1873. Total amount coined, $38,477,149.

Twenty-cent piece, authorized to be coined, act of March 3, 1875; weight, 5 grams, or 77.16 grains; fineness, 900. Coinage discontinued, act of May 2, 1878; total amount coined, $271,000.

For further information, see MONEY. See also COPPER COINS, DIME, EAGLE, GOLD, MINT, SILVER, TRADE-DOLLAR. For foreign dollar coins, see the names of countries to which they belong.

Doll's-Eyes, blue and black glass beads, which are extensively made in Austria and in Birmingham, England, and sold to doll manufacturers.

Dolly, in mining parlance, a perforated board, placed over a tub containing ore to be washed, and which, being worked by a winch-handle, gives a circular motion to the ore. — A machine for washing clothes.

Dolomite, a variety of magnesian limestone, admirably adapted for mortar, as it absorbs less carbonic acid than the common limestone; a white variety of dolomite was used by ancient sculptors.

Dolphin, a spar or buoy, with a large ring in it secured to an anchor, to which vessels may bind their cables. — In hydraulics, the induction-pipe of a water-main, and its cover, placed at the source of supply.

Domba Oil, a fragrant fixed oil obtained in India from the seeds of the Alexandrian laurel (*Calophyllum inophyllum*). It is used for burning and for medicinal purposes, being considered a cure for the itch.

Domesticate, to tame, to make familiar.

Domestic Goods, a general term for all goods and produce of home growth or manufacture.

Domestics, American cotton goods, such as sheetings, shirtings, etc. — Household servants or hired laborers.

Domestic Wines, wine made from native grapes. See WINE.

Domett, a mixed cotton and woollen fabric used for baize; also a kind of white flannel made in Germany.

Domicile, a dwelling; a place of permanent residence.

Domiciled Bill, a bill not made payable at the residence or place of business of the acceptor, but directed for payment by the acceptor at the time of his acceptance.

Dominica, a British West India island, the largest in the Leeward group of the Lesser Antilles, lying between the French islands of Martinique and Guadaloupe, 24 m. N. of the former and about the same distance S. of the latter, at the intersection of lat. 15° 30′ N., lon. 61° 30′ W. It has a length of 29 m., with a maximum breadth of 16 m.; area, 291 sq m. The longer axis is formed by a chain of mountains which attain in some parts a height of upwards of 5,000 feet, and give the whole island a strongly marked profile and great irregularity of surface. The results and symptoms of volcanic activity are abundant in the shape of solfataras, emissions of subterranean vapors, and hot springs; and in the S. part of the island there exists a boiling lake of unascertained depth, in which the water is frequently projected 3 feet or more above the surface by the force of the ebullition. The coasts of the island are not much indented, and the only anchorages of importance are Prince Rupert's Bay and Roseau, both on the N. W. side. The cap. is *Roseau*, or Charlotteville, a fortified port near the S. end of the island; pop. 5,000. The total tonnage of the ships that annually enter

and clear amounts to about 18,000 tons, the four fifths of which belong to Great Britain. The annual imports are valued at about $300,000, and the exports at $350,000. The principal products are sugar, molasses, rum, coffee, cocoa, and oranges. Pop. 27,178.

Dominican Republic. See San Domingo.

Domino, a long, loose cloak of black silk, etc., with a hood removable at will, used as a general disguise at masquerades. — A semi-mask worn by ladies to conceal the upper part of the face at *bals masqués*, etc. — A game played with 28 flat, oblong pieces of ivory or bone, each of which, called a *D.*, is divided by a line into two parts, bearing numbers marked by points. *Imp.* duty, 35 per cent.

Donation, a gift or bequest.

Donkey, an ass for the saddle or for draught.

Donkey-Engine, an auxiliary engine, used principally for pumping water into boilers, lifting heavy weights, etc.

Donkey-Pump, a steam-pump for feeding steam-engine boilers. It is used as a substitute for the feed-pump portion of the large engine. It is also used in breweries, distilleries, etc.


Fig. 139. — Doom-Palm.

Doocoo, an excellent fruit of Java, the *Lansium domesticum.*

Doom-Palm, the *Hyphæne Thebaica* (Fig. 139), which is highly valued in Egypt for its fruit. The wood is used for various domestic purposes; the rind of the fruit, which has the taste of gingerbread, is eaten, and the kernel turned into beads for rosaries.

Doopada Resin, a resin obtained in considerable quantities in the East Indies, from the *Vateria Indica*, which is used as a fragrant incense in the temples, makes an excellent varnish, and is sometimes called East Indian copal, or gum Piney.

Door [Fr. *porte;* Ger. *Thüre*], the movable panel by which the doorway or entrance to any building, apartment, closet, or court is closed. The most common kind of *D.* consists of boards joined together, and nailed to transverse slips of wood. Such as these are called *ledge-doors.* They are hung on staples, and fastened by a latch; they are principally used for workshops, out-houses, offices, and walled gardens. The ordinary house-door is fastened to one side of the doorway by hinges (see Hinges), on which it swings. It is secured by a box-lock fixed to the inner side, or by a mortise-lock, which is buried in the lock-rail, and worked by handles projecting on either side. These *D.* are made of panels fixed in a solid framework, and finished by mouldings of different kinds, which surround the panel. The horizontal pieces of the frame are called *rails*, and the vertical pieces *styles. D.* are technically described by the number of panels they contain, and by the kind of moulding with which they are finished. When they move on hinges, like the ordinary doors of apartments, they are termed *swing-doors.* Large double-*D.*, used to separate any long room, are called *folding-doors.* A *jib-door* is a *D.* in a wall, which cannot well be detected when closed. A *rolling* or *sliding door* is one which travels on rollers, or in a groove, parallel and close to the wall in which is the aperture that it is intended to close. A smaller *D.*, which closes an opening cut in the entrance-door of a courtyard or large building, is called a *wicket-door.* A *trap-door* is a *D.* cut in the floor to give access to cellars, or open parts under the roof of a house. *D.* of large public buildings are sometimes made of brass, or even of stone or marble.

Door-Fastener, the catch for a door.

Door Frame or **Case**, the case in which a door opens and shuts, consisting of two upright pieces and a horizontal one, connected together by mortises and tenons.

Door-Knob, a handle for turning the lock of a door.

Door-Knocker, a hand-rapper for a street door or outer door on a stairway.

Door-Latch, an iron bolt or catch for fastening a door.

Door-Mat, a coarse rough mat placed at doorways, or entrances from the street, to clean the shoes on.

Door-Plate, a metallic engraved name-plate.

Door-Spring, a spring attached to or bearing against a door, so as automatically to close it.

Door-Stop, a knob or block on a skirting-board or floor, against which the door shuts, the object of which is to prevent the door-knob from bruising the wall.

Doputta, a wrapper or garment of cotton, worn by the natives of India.

Doremal, a kind of flowered muslin made in Spain.

Dornick, or **Dornock**, a stout figured linen made for table-cloths; so named from Tournay (Flemish *doornic*), a town of Belgium, or from Dornock, a town of Scotland.

Dorsour, cloth for hanging on the walls of a hall or chapel in Scotland.

Dose, a variable quantity of medicine to be swallowed. — Also the proportion of anything liquid applied in manufacture.

Dot, a small point or spot, made with a pen or other sharp-pointed instrument.

Dotchin, a Chinese portable balance for weighing coins and merchandise, made somewhat after the plan of the steelyard.

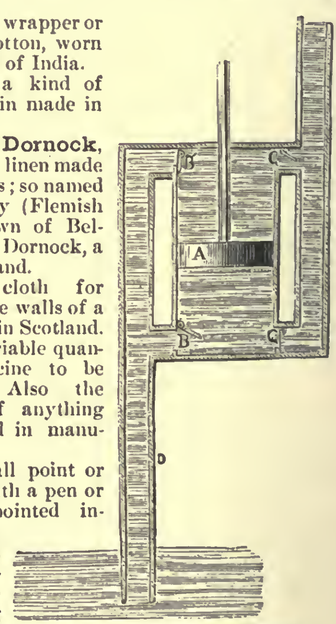


Fig. 140. — Double-acting Pump.

Douanier, a French custom-house officer.

Double-acting Engine. See Steam-Engine.

Double-acting Pump, a pump (Fig. 140) which lifts and forces water at the same time, by

means of a solid piston, A, having induction and eduction valves, B, C, in the upper and lower chambers.

Double-cylinder Engine, a marine engine with two cylinders placed at right angles to the crank-shaft, and at a small distance apart, to give space for the vibration of the rod connecting the crank to the long end of a shaped cross-head, which slides in grooves between the cylinders; the upper ends of the cross-head are connected to the piston-rods.

Doublé d'Or is a kind of French gilt jewelry. The metal used is composed of plate copper with a layer of gold upon it; the thickness of the two being as 11 to 1. The adhesion is produced by means of soldering. The metal is reduced to the required thickness by flattening and drawing, and great care is necessary throughout to prevent the gold from separating from the copper. Many of the articles are made by stamping with steel dies, and the plan seems to offer much scope for taste in design.

Double-Eagle. See EAGLE.

Double-Entry. See BOOK-KEEPING.

Double-Elephant, a size of drawing or flat writing-paper measuring 26 × 40 inches.

Double-milled Cloths are woollen cloths which are fulled or shrunk by being put through the fulling-machine twice.

Double-Pica. See PICA.

Double-Royal, a size of printing-paper 26 × 40 inches.

Doublet, a counterfeit gem made with a colorless front and a colored back, cemented together by clear mastic on the line of the girdle. — A kind of netted silk. — A waistcoat or jacket.

Doubloon, a Spanish and South American gold coin, which weighs 417.70 troy grains, of which 365.49 grains are pure. Mint value, $15.60.

Douceur, a gift, or bonus.

Douche, a surgical instrument for injecting a liquid into a cavity, usually known by the name of the part to which they are applicable.

Dough, flour or meal which has been kneaded with water, and leavened with yeast ready for baking.

Dover. See GREAT BRITAIN.

Dovetail, a joint used by carpenters and joiners in connecting two pieces of wood, by letting one into the other, in the form of the expanded tail of a dove. It is the strongest method of joining masses, because the tenon or piece of wood widens as it extends, so that it cannot be drawn out, the tongue being larger than the cavity through which it would have to be drawn.

Dovetailing. Several examples of dovetailing are given in Fig. 141. The parts which fit into each other are known by different names; the projecting piece, represented in Fig. 1, is called the pin of the dovetail; and the aperture into which it is fitted, as shown in Fig. 2, is called the socket Now, the strength of a dovetail depends upon so proportioning the pin and the socket as to enable them to support, rather than destroy, each other. Let A B C D, Fig. 1, be a scantling, which is required to be joined to another, by means of a single dovetail. The strength of the joint depends on the form of the dovetail, as well as on the proportion it bears to the parts cut away. We shall endeavor to lay down the principle on which the greatest strength may be secured. Having squared the end of the scantling, and gauged it to the required thickness, A I K L M, divide I M into three equal parts, at K and L. Let K L be the small end of the dovetail, and make the angles I K G and M L H equal to about 75 and 80 degrees respectively; and make G E and H F parallel to A N and B O. Then cut away the parts, A I K G E N and B M L H F O, and having formed the socket to correspond, by marking the form of the dovetail on the top of the piece, A B C D, Fig. 2, and cutting away accordingly, the pieces may be fitted together, as shown in Fig. 3. It may be here observed, that the bevel of the dovetail, that is, the angle I K G, Fig. 1, may be either more or less than has been mentioned, according to the texture of the wood. Hard, close-grained woods, not apt to rive or split, will admit of a greater bevel than those which are soft, or subject to split; thus, the bevel of a dovetail in deal must be less than in hard oak, or in mahogany. It is a great fault to make a dovetail too bevelling, for, instead of adding to the strength of the joint, as some persons suppose, it weakens it: for, provided the bevel is sufficient to prevent the possibility of pulling the pieces apart, the less the bevel that is given the better. It must have been observed, that there is a great difference between the dovetail made by the cabinet-maker and by the joiner; the former has very little bevel the latter very much; the former looks neat, and is at the same time strong, while the latter, appearing to aim at strength, looks clumsy, and is at the same time much the weaker of the two. Fig. 4 represents the dovetail in common use for drawer-fronts. When it is required to hide the appearance of the joint in front, the board A B C D is cut with the pin, and A E F B with the socket The pins in this sort of dovetail are in general from about three quarters of an inch to an inch apart, according to the size of the pieces to be joined. Fig. 5 represents the pin part of a lap dovetail, which, when put together, shows only a joint, as if the pieces were rebated together. This kind of dovetail is very useful for many purposes where neatness is required, such as in making boxes.

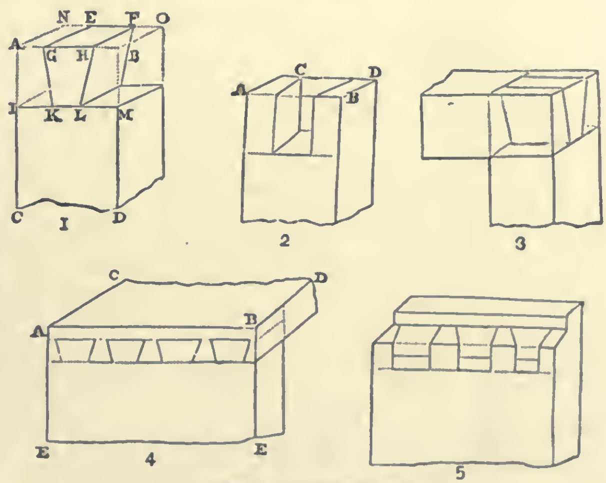


Fig. 141. — DOVETAILING.

Dovetty, a wrapping-cloth or garment of silk, or some mixed fabric, worn by rich natives in Madras.

Dow, an Arabian coasting vessel, with one mast, carrying a lateen sail.

Dowel, a pin of wood or iron used at the edges of boards in laying floors, to avoid the appearance of nails on the surface.

Dowelling, a method of corking, or joining, by letting pieces into the solid, or uniting two pieces of timber together by tenons.

Dowlas, a coarse linen fabric, stout and strong, used for shirting.

Down [Fr. *duvet*; Ger. *Dunen, Flaumfedern*; It. *penna matta, piumini*; Sp. *flojel, plumazo*], the fine feathers from the breasts of several birds, particularly those of the duck kind. That of the eider-duck is the most valuable. These birds pluck it from their breasts, and line their nests with it. It is so very elastic, that a quantity of it weighing only ¾ of an ounce more than fills the crown of the largest hat. That found in the nest is most

valued, and termed *live down;* it is much more elastic than that plucked from the dead bird, which is comparatively little esteemed. The eider-duck is found on the western islands of Scotland, but the down is principally imported from Norway and Iceland. It is extensively used in Europe for bed covering, and is worth about 75 cents per lb. *Imp.* free.

Down-Cast, the ventilating-shaft of a mine, down which air passes to the workings.

Down-Haul, a rope attached to a staysail, or jib, to pull it down by.

Down-Tree, the *Ochroma lagopus* of the West Indies, the seed-pods of which produce a kind of silk cotton used for stuffing pillows, etc.

Doyley, or **Doily**, a small fancy napkin or plate-cover, of different materials.

Dozen, twelve in number.

Drab, a woollen cloth of a dun color, generally woven thick and double milled, for great-coats. — A kind of wooden box used in salt-works for holding the salt when taken out of the boiling-pans.

Drabbets, a coarse linen fabric, or duck.

Drachm, Dram, the name of two English weights. In apothecaries' weight, the eighth part of the troy ounce, or 60 troy grains; and the one sixteenth part of the avoirdupois ounce, or 27⅓½ troy grains. The latter, however, is seldom used. In medicine, the *D.* weight is expressed in prescriptions by the symbol ʒ, equal to 3 scruples; or, in liquids, the eighth part of an ounce measure. — The principal silver coin and money of account in Greece, worth 17 cents.

Draft, an inland or domestic bill of exchange; a check or order for money on a banker or other person. — A deduction allowed from the gross weight of goods. — The quantity of grain or merchandise weighed at one time. — A plan of a building. — A rough copy of any writing. — The draft of a ship is the number of feet she sinks in the water, or the depth of water necessary to float it.

Drafts, or **Draughts**, turned pieces of wood or bone, etc., for playing the game of drafts on a checker-board.

Drag, a dredging-machine. — An instrument with hooks, to catch hold of things under water and bring them to the surface. — A low cart on which a log is dogged in a veneer saw-mill. — A skid, or chain, to lock the wheel of a vehicle in descending hills; a brake. — An agricultural implement (Fig. 142) with hooking tines to haul manure

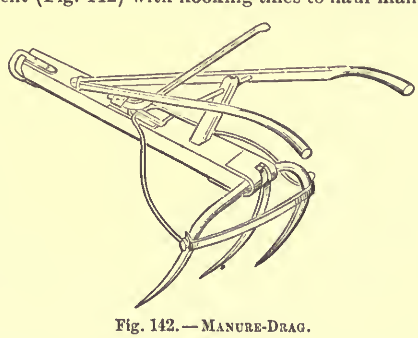


Fig. 142. — Manure-Drag.

along the surface. — In marine engineering, the difference between the propulsive powers of the various floats of a paddle-wheel, or blades of a screw-propeller. — In masonry, a steel instrument for completing the dressing of soft stone without grit. — The bottom part of a mould. — A floating anchor, usually a frame of spars and sails, to keep a ship's head to the wind, and lessen the speed of drifting.

Dragon-Cane, a thick kind of rattan imported from China, with long internodes and a hard bark, less flexible than the common rattans, but strong, springy, and much valued. A variety with soft bark is called Manilla dragon-cane, and is believed to be the stem of *Calamus draco.*

Dragon's Blood, a resinous astringent extract, of a deep red color, obtained from the fleshy fruits of the *Calamus draco*, a plant of Sumatra and the Malay islands. It is chiefly used as a coloring ingredient for spirit and turpentine varnishes and paints, for staining marble, preparing gold lacker, dentifrices, etc. *Imp.* free.

Drag-Rope, a rope attached to a ship, canal-boat, or any object for traction.

Drain, to draw off or filter; also a sink or water-channel.

Drainage, the systematic process employed for carrying off water from land.

Drain-Tile. See Tile.

Drain-Traps, contrivances for preventing the escape of foul air from drains, but allowing the passage of water into them.

Drake, the male of the duck.

Dram, a small quantity of an alcoholic draught.

Drama, a play, whether comic or tragic.

Dramatist, a writer of plays.

Dram-Bottle, pocket glass bottle for travellers and others, cased with leather or straw.

Drap, the French name for cloth of any kind.

Drap d'été, a thin worsted fabric for gentlemen's summer clothing.

Drape, to cover with cloth or drapery; as, to drape an apartment.

Draper, in England, a dealer in cloth.

Drapery, an artist's term for the clothing or dress of a figure or statue; by upholsters it is applied to bed and window curtains, tapestry, and hangings of any kind. — Also a general name in England for the woollen and linen fabrics retailed by drapers. In its primary sense, from the French word "drap," it means woollen goods only, but has been extended to cotton prints and linens. Thus, a dealer in calicoes is called a linen-draper, to distinguish him from what is called a draper, but the goods of both are alike denominated "drapery."

Drapier, a French clothier, or cloth manufacturer.

Draping, the ancient name for making cloth, whence the word "draper."

Drappiere, an Italian weaver.

Drappo, a name for silk stuffs and cloth in Italy.

Drastics, medicines which are rapid and powerful in their operations.

Draught, a liquid form of medicine intended to be taken at once, or at a draught. — See Draft.

Draughts. See Drafts.

Draughtsman, Draftsman, one who draws out plans and designs.

Draw, to haul or pull along. — To sketch or design. — To raise water from a well, or liquors by a trap.

Drawback, a term used in commerce to signify the remitting or paying back of the duties previously paid on a commodity on its being exported. A *D.* is a device resorted to for enabling a commodity affected by taxes to be exported and sold in the foreign market on the same terms as if it had not been taxed at all. It differs in this from a bounty, — that the latter enables a commodity

to be sold abroad for *less* than its natural cost, whereas a *D.* enables it to be sold exactly at its natural cost. Were it not for the system of *D.*, it would be impossible, unless when a country enjoyed some very peculiar facilities of production, to export any commodity that was more heavily taxed at home than abroad; but the *D.* obviates this difficulty, and enables merchants to export commodities loaded at home with heavy duties, and to sell them in the foreign market on the same terms as those fetched from countries where they are not taxed. — Most foreign articles imported into this country may be warehoused for subsequent exportation. In this case they pay no duties on being imported, and, of course, get no *D.* on their subsequent exportation The laws relating to *D.* (*Revised Statutes of the U. States, Edition* 1878) are as follows: —

Customs: — Sect. 2977 Merchandise upon which duties have been paid may remain in warehouse in custody of the officers of the customs at the expense and risks of the owners of such merchandise, and if exported directly from such custody to a foreign country within 3 years, shall be entitled to return duties But proper evidence of such merchandise having been landed abroad shall be furnished to the collector by the importer, and one per cent of the duties shall be retained by the government. — Sect 2978. No merchandise subject to duty shall be entered for *D.*, or exported for *D*, after it is withdrawn from the custody of the officers (except as provided in Sect. 3025) — Sect. 3015. A *D.* of duties shall be allowed and paid on all merchandise imported into the U States, in respect to all such merchandise as shall be exported to any foreign port other than the dominions of any foreign state immediately adjoining to the U. States, either from the district of original importation, or from certain other districts; and all duties, *D*, and allowances which shall be payable, or allowable, on any specific quantity of merchandise, shall be deemed to apply in proportion to any greater or less quantity, except as herein otherwise provided. (See §§ 3036, 2977, 2978) — Sect 3016 No merchandise imported shall be entitled to a *D.* of the duties paid, unless the duties so paid shall amount to $50 at least; nor unless they shall be exported in the original casks, cases, chests, boxes, trunks, or other packages, in which they were imported, without diminution or change of the articles which were therein contained, at the time of exportation, in quantity, quality, or value, necessary or unavoidable wastage or damage only excepted. — Sect. 3017 No *D* of the duties shall be allowed on merchandise entitled to debenture under existing laws, unless such merchandise shall be exported from the U States within 3 years from the date of the importation of the same. One per cent on the amount of all *D* allowed shall be retained for the use of the U. States by the collectors paying such drawbacks, respectively — Sect 3018 All *drugs, medicines*, and *chemical preparations* entered for exportation and deposited in warehouse or public store, may be exported by the owner thereof in the original package, or otherwise, subject to such regulations as shall be prescribed by the Sec of the Treasury — Sect. 3019 There shall be allowed on all articles wholly manuf of materials imported, on which duties have been paid when exported, a *D* equal in amount to the duty paid on such materials, and no more, to be ascertained under such regulations as shall be prescribed by the Secretary of the Treasury. Ten per cent on the amount of all *D.* so allowed shall, however, be retained for the use of the U. States by the collectors paying such drawbacks respectively — Sect 3020 Where *fire-arms, scales, balances, shovels, spades, axes, hatchets, hammers, ploughs, cultivators, mowing-machines*, and *scrapers*, manuf with stocks or handles made of wood grown in the U. States, are exported for benefit of *D.* under the preceding section, such articles shall be entitled to such *D* in all cases when the imported material exceeds one half of the value of the material used — Sect. 3021 *Railroad-iron*, partially or wholly worn, may be imported into the U. States without payment of duty, under bond to be withdrawn and exported after such railroad-iron shall have been repaired or remanufactured The Sec. of the Treasury is hereby authorized and directed to prescribe such rules and regulations as may be necessary to protect the revenue against fraud, and secure the identity, character, and weight of all such importations when again withdrawn and exported, restricting and limiting the export and withdrawal to the same port of entry where imported, and also limiting all bonds to a period of time of not more than six months from the date of the importation — Sect 3022. Imported *salt* in bond may be used in curing fish, taken by vessels licensed to engage in the fisheries, under such regulations as the Sec of the Treasury shall prescribe; and upon proof that the salt has been used in curing fish, the duties on the same shall be remitted — Sect. 3023. Upon all merchandise gaugeable by law, hereafter exported, upon which *D.* or return duty is allowed, and upon all merchandise gaugeable by law, withdrawn from bonded warehouses for export, there shall be collected by the collectors of the several ports ten cents per cask — Sect 3024 Upon all weighable articles hereafter exported, upon which a *D.* or return duty is allowed, and upon all weighable merchandise withdrawn from bonded warehouses for export, there shall be collected by the collectors of the several ports 3 cents per 100 lbs, to be determined by the returns of the weighers. — Sect 3025. No return of the duties shall be allowed on the export of any merchandise after it has been removed from the custody and control of the government, except in the cases provided in sections 3019, 3020, 3022, and 3026. (See § 3036) — Sect 3026. There shall be a *D.* on foreign *saltpetre*, manufactured into gunpowder in the United States and exported therefrom, equal in amount to the duty paid on the foreign saltpetre from which it shall be manuf, to be ascertained under such regulations as shall be prescribed by the Sec of the Treasury, and no more. The word "saltpetre" as used in this section shall be construed to mean the element of nitre, so used, whether it be the nitrate of potash or the nitrate of soda Ten per cent on the amount of *D.* so allowed shall, however, be retained for the use of the U. States by the collectors paying such *D.* respectively — Sect. 3027. No part of the additional or discriminating duty imposed by law on merchandise on account of its importation in foreign vessels shall be allowed to be *D.*, but the whole shall be retained — Sect. 3028 Where articles are imported in bulk they shall be exported in the packages, if any, in which they were landed; for which purpose the officer delivering the same shall return the packages they may be put into, if any, with their marks and numbers, and they shall not be entitled to *D.*, unless exported in such packages, which shall be deemed the packages of original importation, nor unless they fully agree with the return made by the officer. — Sect 3029. It shall be lawful for the exporter of any *liquors in casks*, or any *unrefined sugars*, to fill up the casks or packages out of other casks or packages included in the same original importation, or into new casks or packages corresponding therewith, to be marked and numbered as the original casks or packages, in case the original casks or packages shall, in the opinion of the officer appointed to examine the same, be so injured as to be rendered unfit for exportation, and in no other case. The filling up or change of package must, however, be done under the inspection of a proper officer, appointed for that purpose by the collector and naval officer, where any, of the port from which such liquors or unrefined sugars are intended to be exported; and the *D.* on articles so filled up, or of which the packages have been changed, shall not be allowed without such inspection — Sect. 3030 When the owner, importer, consignee, or agent, of any merchandise entitled to debenture, may wish to transfer the same into packages, other than those in which the merchandise was originally imported, the collector of the port where the same may be shall permit the transfer to be made, if necessary for the safety or preservation thereof — Sect 3032 Every importer, owner, consignee, agent, or exporter, who shall enter merchandise for importation, or for exportation, or transportation from one port to another, with the right of *D*, shall deposit with the collector the original invoice of such merchandise, if not before deposited with the collector, and in that case an authenticated copy thereof, to be filed and preserved by him in the archives of the custom-house, which shall be signed by such importer, owner, consignee, agent, or exporter, and the oath to be made on the entry of such merchandise shall be annexed thereto — Sect. 3036 All merchandise imported into the U States, the duties on which have been paid, or secured to be paid, may be transported by land, or partly by land and partly by water, or coastwise, from the district into which it was imported to any port of entry and exported from such port of entry with the benefit of *D.* — Sect 3038 All debentures shall be issued and made payable to the original importer of the merchandise, entered for exportation, whenever the same shall be requested, in writing, by the exporter, and not otherwise. In respect to any merchandise, on which the duties shall have been paid prior to an entry for exportation, the debenture for the amount of the *D.* of such duties shall be made payable in fifteen days, to be computed from the time of signing the bond, to be given as hereinafter directed — Sect. 3039 Whenever payment of any debenture is refused by the collector of the district where it was granted, for a longer time than three days, after the same shall have become payable, such refusal to be proved in the same manner as the non-payment of a bill of exchange, the possessor or assignee of such debenture may bring suit thereupon against the person to whom it was originally granted or against any indorser thereof. — Sect. 3040. Debentures shall be assignable by delivery and indorsement of the parties who may receive the same — Sect. 3041. Where any merchandise is exported from any other district than the one into which it was originally imported, the collector of such district, together with the naval officer thereof, where there is one, shall grant to the exporter a certificate, expressing that such merchandise was exported from such district, with the marks, numbers, and descriptions of the packages and their contents, the names of the master and vessel in which and the port to which it was exported, and by whom, and the names of the vessel and master in which it was brought, and by whom shipped at the district from whence it came, and

the amount of the drawback to which it is entitled. Such certificate shall entitle the possessor thereof to receive from the collector of the district with whom the duties on the merchandise were paid, a debenture or debentures, for the amount of the *D.* expressed in the certificate, payable at the same time, and in like manner as is herein directed for debentures on merchandise exported from the port of original importation. — Sect. 3042. The collector may refuse to grant such debenture, in case it shall appear to him that any error has arisen, or any fraud has been committed; and in case of such refusal, if the debenture claimed shall exceed $100, it shall be the duty of the collector to represent the case to the Sec. of the Treasury, who shall determine whether such debenture shall be granted or not. In no case, moreover, of an exportation of goods shall a *D.* be paid, until the duties on the importation thereof shall have been first received — Sect 3043. Before the receipt of any debenture, in case of exportation from the district of original importation, and in case of exportation from any other district before the receipt of any such certificate, as is hereinbefore required to be granted, the person applying for such debenture or certificate shall, previous to such receipt, and before the clearance of the vessel in which the merchandise was laden for exportation, give bond, with one or more sureties, to the satisfaction of the collector, who is to grant such debenture or certificate, as the case may be, in a sum equal to double the amount of the sum for which such debenture or certificate is granted, conditioned that such merchandise, or any part thereof, shall not be relanded in any port within the limits of the U. States, and that the exporter shall produce, within the time herein limited, the proofs and certificates required of such merchandise having been delivered without such limits. — Sect. 3044. All bonds which may be given for any merchandise exported from the U. States, and on which any *D.* of duties or allowance shall be payable, in virtue of such exportation, shall and may be discharged, and not otherwise, by producing within one year from the date thereof, if the exportation be made to any port of Europe or America, or within two years, if made to any part of Asia or Africa, a certificate under the hand of the consignee at the foreign port to whom the merchandise shall have been addressed, therein particularly setting forth and describing the articles so exported, their marks, numbers, description of packages, the number thereof, and their actual contents, and declaring that the same have been received by them from on board the vessel, specifying the names of the master and vessel from which they were so received; and where such merchandise is not consigned or addressed to any particular person at the foreign port to which the vessel is destined, or may arrive, but where the master, or other person on board such vessel may be the consignee of such merchandise, a certificate from the person to whom such merchandise may be sold or delivered, by such master or other person, shall be produced to the same effect as that required if the person receiving the same were originally intended to be the consignee thereof. — Sect. 3045. In addition to such certificate, it shall be necessary to produce a certificate under the hand and seal of the consul or agent of the U. States, residing at the place, declaring either that the facts stated in the certificate of such consignee, or other person, are to his knowledge true, or that such certificate is deserving of full faith and credit; which certificates of the consignee, or other person, and consul or agent, shall, in all cases, as respects the landing or delivery of the merchandise, be confirmed by the oath of the master and mate, if living, or, in case of their death, by the oath of the two principal surviving officers of the vessel in which the exportation shall be made. Where there is no consul or agent of the U. States residing at the place of delivery, the certificate of the consignee, or other person hereinbefore required, shall be confirmed by the certificate of two reputable American merchants residing at the place, or if there are no such American merchants, then by the certificate of two reputable foreign merchants, testifying that the several facts stated in such consignee or other person's certificate are, to their knowledge, just and true, or that such certificate is, in their opinion, worthy of full faith and credit; and such certificate shall also be supported by the oath of the master and mate, or other principal officers of the vessel, in manner as before prescribed. The oath of the master and mate, or other principal officers, shall, in all cases, when taken at a foreign port, be taken and subscribed before the consul or agent of the U. States residing at such foreign port, if any such consul or agent reside thereat.

Sect. 3047. In case of loss by sea, or by capture or other unavoidable accident, or when, from the nature of the trade, the proofs and certificates before required are not, and cannot be procured, the exporter shall be allowed to adduce to the collector of the port of exportation such other proofs as they may have, and as the nature of the case will admit; which proofs shall, with a statement of all the circumstances attending the transaction within the knowledge of such collector, be transmitted to the Sec. of the Treasury, who shall have power to allow a further reasonable time for obtaining such proofs; or if he be satisfied with the truth and validity of the proofs adduced, to direct the bond of such exporter to be cancelled. If the amount of such bond shall not exceed the penal sum of $200, the collector, with the naval officer, when there is one, and alone, where there is none, may, pursuant to such rules as shall be prescribed by the Sec. of the Treasury, admit such proof as may be adduced; and if they deem the same satisfactory, cancel such bond accordingly.

Sect. 3049. If any merchandise entered for exportation, with intent to *D.* the duties, or to obtain any allowance given by law on the exportation thereof, shall be landed within any port within the limits of the U. States, all such merchandise shall be subject to seizure and forfeiture, together with the vessel from which such merchandise shall be landed, and the vessels or boats used in landing the same; and all persons concerned therein shall, upon indictment and conviction thereof, suffer imprisonment for a term not exceeding six months — Sect. 3050. If any merchandise, of which entry shall have been made in the office of a collector, for the benefit of *D.* or bounty upon exportation, shall be entered by a false denomination, or erroneously as to the time when and the vessel in which it was imported, or shall be found to disagree with the packages, quantities, or qualities, as they were at the time of original importation, except such disagreement as may have been occasioned by necessary or unavoidable wastage or damage only, and except also in cases where permission shall have been obtained according to law to alter or change the quantities or packages thereof, all such merchandise, or the value thereof to be recovered of the owner or person making such entry, shall be forfeited, and the person making such false entry shall also forfeit a sum equal to the value of the articles mentioned or described in such entry. — Sect. 3051. No forfeiture shall be incurred under the preceding section if it shall be made to appear to the satisfaction of the collector, or of the court in which a prosecution for the forfeiture shall be had, that such false denomination, error, or disagreement happened by mistake or accident, and not from any intention to defraud the revenue. — Sect. 3053. Any merchandise imported from the British N. American provinces adjoining the U States, which shall have been duly entered and the duties thereon paid or secured according to law at either of the ports of entry in the collection-districts situated on the N., N. E., and N. W. frontiers of the U States, may be transported by land or by water, or partly by land and partly by water, to any port or ports from which merchandise may be exported for benefit of *D.*, and be thence exported with such privilege to any foreign country. The laws relating to the transportation of merchandise entitled to *D.*, and the due exportation and proof of landing thereof, and all regulations which the Sec. of the Treasury may prescribe for the security of the revenue, must, however, be complied with. — Sect. 3054. Any imported merchandise, in the original packages, which shall have been duly entered and warehoused, may be exported therefrom in conformity with law, and be transported, in the manner indicated, to ports in the adjoining British provinces, and become entitled to the benefits of those provisions. — Sect. 3056. Any imported merchandise which has been entered, and the duties paid or secured according to law, for *D.*, may be exported to the British N. American provinces adjoining the U. States.

Internal Revenue. Sect. 3329. *Distilled spirits* upon which all taxes have been paid may be exported with the privilege of *D.*, in quantities of not less than 1,000 gallons, and in distillers' original casks containing not less than 20 wine-gallons each, on application of the owner thereof to the collector of customs of any port of entry, and under such rules and regulations, and after making such entry as may be prescribed by law and by the Sec. of the Treasury. The entry for such exportation shall be in triplicate, and shall contain the name of the person applying to export, the name of the distiller, the name of the district in which the spirits were distilled, the name of the vessel by which and the name of the port to which, they are to be exported; and the form of the entry shall be as follows: —

Export Entry of Distilled Spirits entitled to Drawback.

Entry of Spirits distilled by —— ——, in —— District, State of ——, to be exported by —— ——, in the ——, whereof —— —— is master, bound to ——.

And the entry shall specify the whole number of casks or packages, the marks and serial numbers thereon, the quantity and kind of spirits as known in commerce, the number of gauge or wine-gallons and of proof-gallons; and the amount of the tax on such spirits shall be verified by the oath of the owner of the spirits, and that the tax has been paid thereon, and that they are truly to be exported to the port of ——, and not to be relanded within the limits of the U. States. One bill of lading, duly signed by the master of the vessel, shall be deposited with such collector, to be filed at his office with the entry retained by him. One of said entries shall be, when the shipment is completed, transmitted to the Sec of the Treasury to be recorded and filed in his office The lading on board said vessel shall be only after the receipt of an order or permit signed by the collector of customs and directed to a customs gauger, and after each cask or package shall have been distinctly marked or branded by said gauger, as follows: "For export from U. S. A.," and the tax-paid stamps thereon obliterated. The casks or packages shall be inspected and gauged alongside of or on the vessel by the gauger designated by said collector; and on application of said col-

lector it shall be the duty of the surveyor of the port to designate and direct one of the custom-house inspectors to superintend such shipments. — Sect. 3386. There shall be an allowance of *D.* on *tobacco*, *snuff*, and *cigars* on which the tax has been paid by suitable stamps affixed thereto before removal from the place of manufacture, when the same are exported equal in amount to the value of the stamps found to have been so affixed, the evidence that the stamps were so affixed, and the amount of tax so paid, and of the subsequent exportation of the said tobacco, snuff, and cigars, to be ascertained under such regulations as shall be prescribed by the Commissioner of Internal Revenue and approved by the Sec of the Treasury. Any sums found to be due under the provisions of this section shall be paid by the warrant of the Sec. of the Treasury on the Treasurer of the U. States: *Provided*, That no claim for an allowance of *D.* shall be entertained or allowed for a sum less than $50, nor except upon evidence satisfactory to the Commissioner of Internal Revenue that the stamps affixed to the tobacco, snuff, or cigars alleged to have been exported were totally destroyed before the shipment thereof, and that the same have been landed in a foreign country or lost at sea, and have not been relanded within the limits of the U. States. Sect. 25 of an act approved Feb. 8, 1875, declares, "That if any person or persons shall fraudulently claim or seek to obtain an allowance or *D.* of duties on any manufactured tobacco, or shall fraudulently claim any greater allowance or *D.* thereon than the duty actually paid, such person or persons shall forfeit triple the amount wrongfully or fraudulently claimed or sought to be obtained, or the sum of $500 at the election of the Sec. of the Treasury, to be recovered as in other cases of forfeiture provided for in the Internal Revenue Laws." — Sect 3441. There shall be an allowance of *D.* on fermented liquors, and on all articles mentioned in Schedule A. (*medicines or preparations, perfumery and cosmetics, and playing cards*) (see STAMP DUTIES), on which any internal tax shall have been paid, except lucifer or friction *matches*, *cigar-lights*, and *wax-tapers*, equal in amount to the tax paid thereon, and no more, when exported; to be paid by the warrant of the Sec. of the Treasury on the Treasurer of the U. States: *Provided*, That no allowance of *D.* shall be made for any amount, claimed or due, less than $10. The evidence that any such tax has been paid as aforesaid shall be furnished to the satisfaction of the Commissioner of Internal Revenue by the person claiming the allowance of *D.*, and the amount shall be ascertained under such regulations as shall be prescribed from time to time by the Commissioner, under the direction of the Sec. of the Treasury. And the said Sec. may make such regulations with regard to the form of certificates of *D.* and the issuing thereof as he may deem necessary. — Sect. 3443. Whenever any person fraudulently claims or seeks to obtain an allowance of *D.* on goods, wares, or merchandise on which no internal duty shall have been paid, or fraudulently claims any greater allowance of D. than the tax actually paid as aforesaid, he shall forfeit triple the amount wrongfully or fraudulently claimed or sought to be obtained, or the sum of $500, at the election of the Sec. of the Treasury. — To obtain the *D.* provided for in the foregoing sections, the exporter must, at least six hours previous to shipment, file with the collector of customs an entry in printed form to be found at every Custom-House Broker.

Drawbar, an iron rod used to connect a locomotive with a tender.

Drawbridge, a bridge that can be lifted or swung to allow masted vessels to pass, or to prevent crossing.

Drawer and Drawee. The former is the person from whom the direction to pay a bill of exchange emanates; the latter is the person whom he directs to pay, or on whom he draws. The expression "drawee" is correctly applicable only between drawing and acceptance. The drawer's name must appear upon the bill, either in the body of it or at the end; and his liability as a party to the bill is completed by delivery to a payee. A drawer against whom recourse is to be preserved ought to have notice of non-acceptance or non-payment. See BILL OF EXCHANGE, and NOTICE.

Drawers, sliding boxes or cases in a table or other article of household furniture, which can easily be drawn out and returned to their places. — A close under-garment made to draw over the nether limbs.

Drawing, a process in the preparation of flax. See FLAX-DRESSING.

Drawing-Board, a square frame used by artists for holding a sheet of paper while plotting, projecting, etc.

Drawing-Knife, a blade with a handle at each end, used by joiners, coopers, etc., for shaving off surfaces; a tool used by carpenters to cut a groove for a saw to follow, to prevent excoriation of the surface of the wood.

Drawing-Paper, thick sized paper, generally made of linen stock, for draughtsmen and water-color painters. The usual sizes are: —

Cap	13	×	16	inches
Demy	15.5	×	18.5	"
Medium	18	×	22	"
Royal	19	×	24	"
Super-royal	19	×	27	"
Imperial	21.25	×	29	"
Elephant	22.25	×	27.75	"
Columbier	23	×	33.75	"
Atlas	26	×	33	"
Theorem	28	×	34	"
Double Elephant	26	×	40	"
Antiquarian	31	×	52	"
Emperor	40	×	60	"
Uncle Sam	48	×	120	"

Drawing-Pen, a pen used by draughtsmen for drawing lines of various thickness, consisting of a pair of steel blades regulated by a screw, and between which the ink is contained.

Drawing-Pencil, a black lead-pencil of hard quality, used for drawing.

Draw-Link, a contrivance for connecting railway carriages together.

Draw-Plate, a stout plate of shear steel, pierced with one or more holes for drawing wire through. See WIRE-DRAWING.

Dray, a low cart or carriage constructed to carry heavy burdens.

Drayage. See CARTAGE.

Dredge, a drag-net for taking oysters, etc.; any instrument or machine for dredging the bottom of water; a dredging-machine.

Dredging-Box, a tin box with perforations in the lid for sprinkling flour on meat, etc.

Dredging-Machine, an engine used to clear away sandbanks, and to take up mud or gravel from the bottoms of rivers or harbors.

Dregs, the lees or sediment of liquors; the refuse in the manufacture of tallow.

Drench, a term applied to any liquid medicine or mixture administered to horses and neat cattle, and chiefly to the latter.

Dresden See SAXONY.

Dresden Ware. See PORCELAIN.

Dressed, a term applied to stone or other material, shaped and smoothed. — Ore prepared and fitted for use. — Skins or hides tanned and prepared for use, as leather.

Dresser, a mallet used by plumbers for flattening lead.

Dress Goods, a term applied to fabrics for the outer garments of women and children, most commonly to those made of mixed materials, as silk and cotton, silk and linen, silk and worsted, cotton and worsted, and cotton and linen, though also applicable to piece silks, printed linens, and calicoes; but the term is not used for fabrics intended for petticoats or under-garments. — *T. McElrath.*

Dressing, any preparation of gum, starch, size, etc., employed in stiffening or "finishing off" textile fabrics and paper. — In surgery, any application to a wound or sore, made by means of lint, linen, or leather. — In agriculture, a compost, or manure, distributed over land.

Dressing-Case, a box fitted with apparatus and toilet utensils for the dressing-room.

Dressing-Gown, a loose morning robe or wrapper.

Dress-Maker, a mantua-maker; one who makes ladies' dresses.

Dreyling, an Austrian liquid measure = 448½ gallons.

Drier, a material added to oil paints. See DRYER.

Drift, the course or direction of a sea-current. — The distance to which a ship diverges from her proper course, owing to currents, contrary winds, etc.; as, to make leeway *drift*. — Those parts in the sheer draught of a ship, where the rails are cut off and ended with a scroll. Pieces fitted to form the drifts bear the name of *drift-pieces*. — A term applied by shipwrights to the discrepancy between the size of a bolt and that of the hole intended to receive it; also, to the difference between the circumference of a mast and that of the hoop required to fit it. — A passage in a mine cut under the earth from shaft to shaft. — In machinery, a piece of hardened steel, notched at the sides, and made slightly tapering; it is used for enlarging a hole in a piece of metal to a particular size by being driven into it.

Drift-Net, a fishing-net about 20 feet deep by 120 feet long, well corked at the top, but without lead at the bottom. The size of the mesh is 2½ inches or upwards; frequently a dozen or more of these nets are attached to each other by a drift-rope.

Drift-Wood, wood thrown on the shore of seas or rivers.

Drill, a tool used for boring holes in wood, metal, stone, bones, etc. It is formed in different ways,

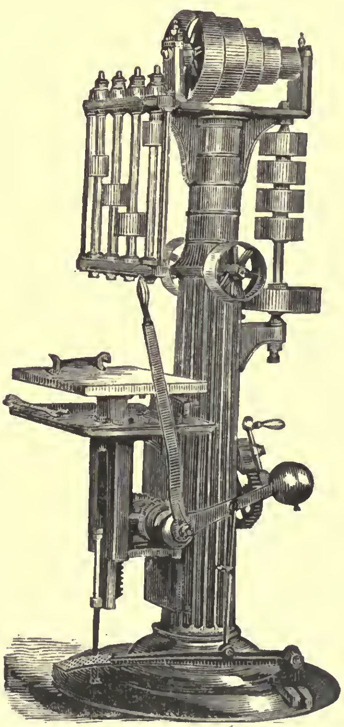


Fig. 143. — VERTICAL DRILLING-MACHINE.

according to the kind of hole it is required to make, and the material which it has to penetrate. Drills for boring iron have pointed heads, with sharp edges projecting from them, that cut in different directions. Those for boring wood are like an auger or large gimlet, or they are broad and flat, with a projecting spike in the centre, and cutting edges on either side: drills of this form are called *centre-bits*. These tools are worked by a rotary motion, imparted to them by a cranked handle, having a socket and spring at one end to receive and hold the drill, and a boss at the other, against which the workman presses his chest; or by a bow of steel, with a strong piece of catgut attached to it loosely enough to admit of its being passed once or twice round a pulley, through the centre of which the tool passes. The workman presses the drill against the material that he is boring by his chest, which is protected by a plate of metal. — A *Drilling-machine* is a machine carrying a rotating tool and a means for chucking the object to be bored. — These machines differ much in size and appearance, in the mode of presenting the tool, and presenting and chucking the work. — The *Vertical* machine (Fig. 143) has a vertical rod, to the lower end of which a drilling tool can be easily affixed; the tool revolves very rapidly, and soon worms its way into any piece of metal placed beneath it. The *Radial* machine has the tool affixed to a radial arm, which is movable. Range of operation in different directions is hereby obtained. See ROCK-DRILL. — Also an agricultural machine for sowing seeds in rows. A great variety of drills are now in use; but that formed on the principle of lifting the grain in small cups, which empty themselves into tin tubes, by which the grain is conducted to the coulters (Fig. 144), is the most generally adopted; but when the soil is uneven, a lighter machine should be used.

Drills, heavy twilled fabrics of either cotton or linen. Cotton drills are largely used by farmers in the Eastern States for "hay-caps;" they also form an important article of export to the East Indies and South America. Linen drills are used for trousers stuff, for covering stair-carpets, and various other purposes. — *T. McElrath.*

Drinking-Horn, a cup made out of pressed horn.

Dripping-Pan, a tin dish for receiving the gravy and fat which drops from meat in roasting before the fire.

Dripstone, a filtering stone.

Driver, a coachman; one who drives beasts; the manager of a locomotive engine. — A storm-sail, a sailor's name for a spanker. — A piece of wood upon a weaver's spindle, which impels the shuttle through the opening in the warp.

Driving-Band, the strap, belt, or gearing for uniting, turning, and carrying machinery.

Driving-Wheels, the large wheels of a locomotive engine.

Drogher, a West India cargo boat employed in coasting, with long light masts and lateen sails.

Drop, a machine for lowering coals from railroad straiths into the holds of colliers. — A confection, of which the principal basis is sugar. Drops differ from lozenges chiefly in the ingredients being combined by the aid of heat. Occasionally they are medicated.

Preparation. Double-refined sugar is reduced to powder, and passed through a hair sieve (not too fine), and afterwards through a gauze sieve, to take out the fine dust, which would destroy the beauty of the drop. It is then put into a clean pan, and moistened with any favorite aromatic, as rose or orange-flower water, added slowly, stirring it with a paddle all the time, from which the sugar will fall, as soon as it is moist enough, without sticking. The coloring (if any) is next added, in the liquid state, or in very fine powder. A small, polished copper, or tinned-copper pan, furnished with a lip, is now one half or three parts filled with the paste, and placed over the fire, or over the hole of a stove, or preferably on a sand bath, and the mixture stirred with a little bone or glass spatula until it becomes liquid. As soon as it almost boils, it is taken from the fire, and if it is too moist, a little more powdered sugar is added, and the whole stirred, until it is of such a consistence

as to run without too much extension. A tin plate, very clean and smooth, and very slightly oiled, being now ready, the pan is taken in the left hand, and a bit of bright iron, copper, or silver wire, about 4 inches long, in the right. The melted sugar is next allowed to fall regularly on the tin plate, the wire being used to remove the drop from the lip of the pan. In two or three hours afterwards the drops are taken off with the blade of a knife, and are at once put into bottles or tins. On the large scale, "confectionery drops" are moulded by a machine consisting essentially of two metal rollers covered with hollows. A sheet of the warm and soft composition, on being passed between the rollers, is at once converted into a batch of symmetrical drops, the upper and lower halves being moulded by the corresponding hollows of the upper and lower rollers

Drosky, Droitzschka, a Russian low four-wheeled carriage, somewhat resembling a sledge.

Drosometer, an instrument by which is ascertained the quantity of a night's dew-fall. It consists of a balance, one end of which is furnished with a plate to receive the dew, while the other contains a weight protected from it.

Dross, the waste matter thrown off by metals during the process of smelting; also, generally the excrementitious dregs, remains, or refuse of any substance.

Drug, an article of slow sale, or in no demand in the market. — A name applied to all animal and vegetable products used in pharmacy; the raw material from which medicines are compounded.

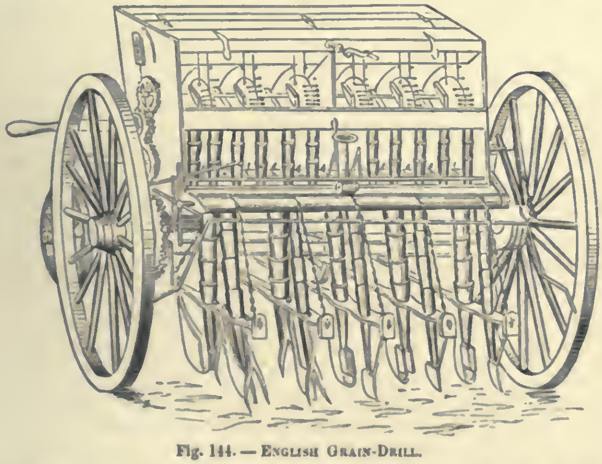


Fig. 144. — English Grain-Drill.

Imp. duty: crude *D.*, not otherwise provided for, 20 per cent; crude *D.* for dyeing or tanning, free. See Drawback, and Stamp-Duties.

Inspection of Drugs and Medicines. By an act of Congress, passed June 26, 1848, to prevent the importation of adulterated and spurious drugs and medicines, it is provided, that all drugs and medicines, medicinal preparations, including medicinal essential oils and chemical preparations used wholly or in part as medicine, imported into the U. States from abroad, shall, before passing the custom-house, be examined and approved, as well in reference to their quality, purity, and fitness for medicinal purposes as to their value and identity specified in the invoice. — Also, that all medicinal preparations, whether chemical or otherwise, usually imported with the name of the manufacturer, shall have the true name of the manufacturer, and the place where they are prepared, permanently and legibly affixed to each parcel, by stamp, label, or otherwise; and all such medicinal preparations, imported without such names affixed as aforesaid, shall be adjudged to be forfeited. — That if, on examination, any drugs, medicines, medicinal preparations, whether chemical or otherwise, including medicinal essential oils, are found, in the opinion of the examiner, to be so far adulterated, or in any manner deteriorated, as to render them, in strength and purity, inferior to the standard established by the pharmacopœias and dispensaries of the U. States, Edinburgh, London, France, and Germany, and thereby improper, unsafe, or dangerous to be used for medicinal purposes, a return to that effect shall be made upon the invoice; and the articles so noted shall not pass the custom-house, unless, on re-examination of a strictly analytical character, called for by the owner or consignee, the return of the examiner shall be found erroneous; and it shall be declared, as the result of such analysis, that the said articles may properly, safely, and without danger, be used for medicinal purposes. — That the owner or consignee shall at all times, when dissatisfied with the examiner's return, have the privilege of calling, at his own expense, for a re-examination; and depositing with the collector such sum as the latter may deem sufficient to defray such expense, it shall be the duty of that officer to procure some competent analytical chemist possessing the confidence of the medical profession, as well as of the colleges of medicine and pharmacy, if any such institutions exist in the State in which the collection district is situated, a careful analysis of the articles included in said return, and a report upon the same, under oath; and in case the report, which shall be final, shall declare the return of the examiner to be erroneous, and the said articles to be of the requisite strength and purity, according to the standards referred to in the next preceding section of this act, the entire invoice shall be passed without reservation, on payment of the customary duties; but in case the examiner's return shall be sustained by the analysis and report, the said articles shall remain in charge of the collector, and the owner or consignee, on payment of the charges of storage and other expenses necessarily incurred by the U. States, and on giving of bond, with sureties satisfactory to the collector, to land said articles out of the limits of the U. States, shall have the privilege of re-exporting them at any time within the period of six months after the report of the analysis; but if the said articles shall not be sent out of the U. States within the time specified, it shall be the duty of the collector, at the expiration of the said time, to cause the same to be destroyed, holding the owner or consignee responsible to the U. States for payment of all charges, in the same manner as if said articles had been re-exported.

Drugget, a coarse flimsy woollen fabric, printed or plain, chiefly used for carpeting and packing. It is largely manuf. in the U. States and in England.

Druggist, properly one who buys or sells drugs, a wholesale dealer; but commonly applied to one who combines the retail business of chemist and druggist, and sells, besides, various miscellaneous surgical articles in common demand.

Drug-Mill, a mill where drugs, etc., are crushed and ground.

Drum, a military musical instrument, commonly made of thin cylinders of wood, hollow within, and covered at the ends with sheets of vellum, which may be stretched or slackened at pleasure by means of small cords and sliding-knots; it is beat upon with a pair of short sticks, one in each hand of the performer. *Kettle-drums* are hollow hemispheres made of brass, and are used in pairs; one of them being tuned to the key-note, and the other to the fifth of the key. Small *D.*, hanging from the drummer's belt at the side, and beaten with the *chamade* or *roulade*, are styled *side-drums*. — A hollow cylinder which, fixed in position on a shaft, communicates motion to another shaft by means of a revolving leather or gutta-percha band. — A hollow and thin chamber of a cylindrical form, used in heaters, stoves, and flues. It generally forms a mere casing, but in some cases, as steam-drums, is adapted to stand considerable pressure. — A cylindrical box in which dried fruit is sold, weighing when full from ½ to ¼ of a cwt.

Drumhead, the top of a capstan, containing the holes in which the capstan bars are fixed. — The parchment or vellum skin stretched on the top of a drum.

Drummond Light, a very intense light produced by projecting a blowpipe flame of mixed oxygen and hydrogen gases upon a ball of lime, the intense heat raising the lime to vivid incandescence. One of the most convenient forms of apparatus for its production is represented in Fig.

145, when the mixed gases escaping by the jet, *a*, being set fire to and made to impinge upon the cylinder of lime, *b*, raise the surface of the latter nearest the jet to a white heat, accompanied by a dazzling light. As minute portions of lime become detached and are volatilized from the spot on the lime on which the jet of burning gases strikes, it is necessary to expose a new surface of lime to the gases, and for this purpose the screw, *c*, may be turned by the hand or by clockwork. Owing to the great explosiveness of a mixture of hydrogen and oxygen gases, special precautions are required. The hydrogen and oxygen ought to be confined in separate gas-holders or bags, and to be brought by different tubes, H and O, provided with separate stop-cocks, to within a short distance of the exit jet. The common tube through which the mingled gases pass to the jet is about 9 inches long by ⅜ of an inch in diameter; and in Mr. Hemming's construction (called *Hemming's jet*) the tube is tightly packed with fine wires through which the mixed gases have to pass on their way to the jet, and which, when the pressure is deficient, prevent the return of the flame, which might lead to disastrous explosion. *D. L.* is often called *Lime Light;* it is also called *Magnesia Light* or *Zirconia Light*, when magnesia or zirconia are used instead of lime. In the *Oxycalcium Light* a jet of oxygen gas is blown through a spirit-flame upon a ball of lime. When a coal-gas flame replaces the spirit-flame it is sometimes called *Oxy-coal-gas Light*. The general name for all these lights is the *Oxyhydrogen Light*.

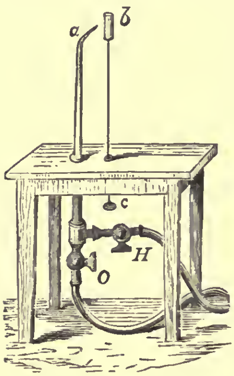


Fig. 145. — Drummond Light.

Dry Dock. See Dock.

Dryer, a substance, as litharge, sugar of lead, white copperas, etc., employed, as the name implies, to increase the drying and hardening properties of oil paints.

Dry-Goods, a commercial name for textile fabrics, cottons, woollens, silks, laces, etc.

Drying-Machine. In many departments of manufacture, such as bleaching, calico-printing, dyeing, paper-making, etc., substances are dried quickly by being put into a hollow drum or cylinder, and rotated with great velocity. The moisture driven from the substance by centrifrugal action escapes through holes in the drum into an outer case or receptacle.

Drying-Oils, linseed and other oils which, having been heated with oxide of lead, dry quickly on exposure to the atmosphere and retain their transparency on solidifying. *D.-O.* are essential for the purposes of the painter and for the manufacture of printing-ink; they also form the basis of many paints and varnishes. Castor-oil, linseed-oil, poppy-oil, and walnut-oil are among the *D.-O.*

Dry Measure, a standard of quantity, by which dry, coarse, or bulky articles are measured.

Drying-Stove, a stove used by laundresses; also one employed by founders and others.

Dry-Rot, a decay in timber; a disease which attacks wood, and renders it brittle, by destroying the cohesion of its parts. See Timber (Preservation of).

Dry-Salter, a dealer in the minerals used in pickling, salting, and preserving various kinds of food. Also in gums, drugs, dye-stuffs, mineral colors, tanning substances, artificial manures, etc.

Dry-Stove, a glazed structure designed for the protection of the plants of dry, arid climates; a hot-house in which the air is kept less moist than in the bark-stove. It is particularly adapted to succulent plants. The temperature should be higher than that of a greenhouse.

Dry-Wines are wines in which the saccharine matter and the ferment are so exactly balanced that they have mutually decomposed each other, and no sweetness is perceptible.

Dualin, an explosive compound, composed of nitro-glycerine mixed with saw-dust, or wood-pulp, such as is used in paper-mills; the latter being first treated with nitric and sulphuric acids. The object of the mixture is to diminish the danger connected with the storage and transportation of nitro-glycerine.

Dubber, Dupper, a leather bottle or skin bag, used chiefly in India for holding oil, ghee, and other liquids, and capable of holding, according to size, from 20 to 80 lbs. weight.

Dubbing, a greasy composition used by the curriers to dress leather, and by shoemakers and others to soften leather, and to render boots and shoes water-proof. A good *D.* is prepared by boiling to a proper consistence 2 lbs. black resin, 1 lb. tallow, and 1 gallon crude cod oil or train oil.

Dublin. See Great Britain.

Dubuque and Sioux City R.R. runs from Dubuque to Iowa Falls, Ia. This Co., whose offices are in Dubuque and New York City, was formed upon the sale, under foreclosure, in 1860, of the Dubuque and Pacific R.R. It was opened to its present terminus in 1866, and in 1867 was leased for 20 years to the Illinois Central R.R. Co., for 35 % of the gross earnings for the first 10 years and 36 % for the other ten, and payment of all taxes and assessments. The Illinois R.R. Co. may, at the expiration of the first lease, take a perpetual one for 35 % of the gross earnings. *Financial statement*, 1878: Cap. stock, $5,000,000; 1st mortgage tax-free bonds, $882,000, payable 1883 and 1894, int. 7 % (Jan. and July).

Dubuque and Southwestern R.R. runs from Farley, Ia., to Cedar Rapids, Ia. This Co., whose offices are in Dubuque, leased the road, which was opened in 1864, to the Chicago, Milwaukie, and St. Paul R.R. Co. in 1878. *Financial statement:* Cap. stock, common, $588,400, preferred, $589,600. Funded debt, $548,415, consisting of 1st mortgage bonds, $78,500, payable July, 1883, int. 7 %; 1st mortgage bonds, $450,000, payable October, 1883, int. 7 %; funded coupons, $19,-915, payable 1879 and 1880, int. 7 %.

Duchess-Slates, large sized-slates, 24 by 12 inches.

Duck, a linen or cotton fabric lighter and finer than canvas, used for small sails, seamen's trousers, etc. The American cotton *D.* is 22, 28½, 29, and 40 inches in width. — A water-fowl, wild and domesticated, much esteemed as food.

Ductility, a property belonging chiefly to certain metals, by which they are capable of being drawn out into wire; that is, of being increased in length and diminished in thickness without fracture. The most ductile substances with which we are familiar, are gold, silver, platinum, iron, and softened glass. Wollaston obtained a platinum wire of 0.00003 of an inch in diameter, by first coating a fine platinum wire with silver, and drawing the cylinder thus formed into as fine a

wire as possible, and then dissolving the silver in dilute nitric acid. By this means a platinum wire was obtained having a diameter so fine that 1,060 yards of it weighed only $\frac{2}{3}$ of a grain. See MALLEABILITY.

Due-Bill, an acknowledgment of a debt in writing, not transferable like a promissory note by mere indorsement.

Duffels, Duffields, a thick coarse kind of woollen cloth having a thick nap or frieze.

Dugong, a name in Australia and the Indian Ocean for the *Halicore dugong*, a marine animal which is taken for the oil obtained from the blubber. This oil is asserted to be equal to cod-liver oil, and is a cure for diseases of the ear. The bone of the animal, in fineness and hardness of grain, specific gravity, and appearance, approaches nearly to the nature of ivory. The flesh of the dugong is often eaten.

Dulcamara. See NIGHTSHADE (WOODY).

Dulcimer, a small musical instrument consisting of a triangular chest, strung with wires, which are struck with a little rod held in each hand.

Dumb-Bells, heavy metal weights swung in the hands for exercise, to open the chest and increase muscular strength.

Dumb-Singles, a kind of silk merely wound and cleaned.

Dumb-Waiter, a stand with shelves placed on a movable frame (Fig. 146), enabling viands, etc. to be passed from one story of a house to another; thus dispensing with the attendance of servants for that purpose.

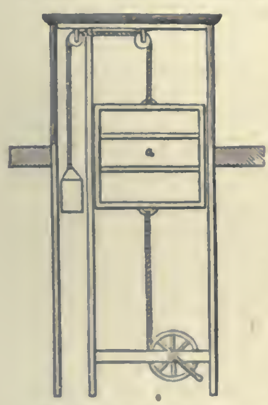


Fig. 146.— DUMB-WAITER.

Dummy, a sham copy of an original packet or package of any salable commodity.

Dump, to throw down violently, as in emptying a cart by tilting it over.

Dumping-Cart, a cart that may be tilted over, to free it from its contents.

Dumpy, short and thick.

Dumpy-Level, a spirit-level with a telescope for surveying purposes.

Dundee. See GREAT BRITAIN.

Dunder, the fermenting lees of cane-juice, used in the distillation of rum.

Dunfish, codfish cured in such a manner as to produce a dun, brown color.

Dung, the excretory deposit of animals; a general name for farmyard or stable manure. The dung of most animals possesses a commercial value; that of dogs and of pigeons is used in tanning, horse-dung in foundries, that of cows in calico-printing.

Dungallie, a small liquid measure in the East of 2¼ seers; 11¼ dungallies making one choradang, = 1$\frac{3}{32}$ quart.

Dungaree, Dungary, a coarse kind of unbleached Indian calico.

Dunghill, a waste heap of ashes, refuse substances of manure, etc.

Dunghill-Fork, a prong for lifting or turning straw, manure, etc., in a farm or stable yard, etc.

Dunging, one of the principal processes in the arts of calico-printing and dyeing, its object being to free the cloth from loose matters which would interfere with the dyeing.

After the thickened mordants have been applied to the fabric and properly fixed, it is necessary to remove the now useless thickening matter, together with the excess of mordant, which has not come into actual contact with the cloth. Formerly a bath formed of cow-dung, diffused through hot water (130° to 212° F.), was always used to wash away these loose matters; but now various manufactured substances are successfully employed for the purpose. The best dung substitutes are the arsenite and arseniate of soda, the silicate of soda, and phosphate of lime. Experience proves that, in the case of these substitutes, a final wince in cow-dung before dyeing is advantageous. A process very similar to "dunging" is employed after dyeing, to clear and give purity to the undyed parts. This subsequent process is distinguished by the term "clearing." Cow-dung has been used in "clearing" operations, but its employment is not to be recommended. Bran scalded and mixed with water is employed for certain goods, but bleaching-powder is the most generally used "clearing agent"

Dunkerque, Dunkirk. See FRANCE.

Dunkirk, Alleghany Valley, and Pittsburg R.R. runs from Dunkirk, N. Y., to Titusville, Pa., 90.60 m. This Co., whose offices are in Dunkirk, was formed in 1872 by the consolidation of the Dunkirk, Warren, and Pittsburg and the Warren and Venango R.R. Cos. It is leased by the N. Y. Central and Hudson River R.R. Co., which pays interest on the funded debt as rent. *Financial statement:* Cap. stock, \$1,300,000; funded debt, \$3,200,000, consisting of 1st mortgage 7% 20-year bonds payable 1890, \$2,000,000; 2d mortgage 7% 20-year bonds payable 1890, \$1,000,000; 3d mortgage 7-% 20-year bonds payable 1890, \$200,000. Annual charge, \$224,000. Net deficit for 1878, \$645.30.

Dunlop Cheese. See CHEESE.

Dunnage, a name given to the pieces of loose wood placed on the bottom and sides of a ship's hold, either to support the cargo, so that the vessel may be properly ballasted, or to prevent injury from leakage.

Dunning, a common term for urgent pressing for the payment of a debt. — Also a mode of curing codfish, so as to give them a partial color.

Dunstable Straw, wheat straw used for bonnet plaits, and so called from having been first manufactured in Dunstable, a town of England. The middle part of the straw above the last joint is selected; it is cut into lengths of about 10 inches, which are then split by a single machine into slips of the requisite width. Whole *D.* signifies that the plait is formed of seven entire straws, while patent *D.* consists of fourteen split straws.

Dunter-Goose, a name given to the eider-duck.

Duodecimo, a volume formed by folding the sheet into 12 leaves, making 24 pages. It is written, for shortness, 12mo.

Dupion, a double cocoon formed by two silkworms.

Duplex, twofold or doubled; as a *D. lathe*, or one that turns two sets of cutting tools at the same time; a *D. watch*, or one that has a double escapement.

Duplicate, a second article of the same kind. — A copy or transcript.

Durma Mats, mats made in India of the split stalks of the nul or nar, a grass of Bengal.

Duro, the hard dollar of exchange of Spain, of 20 reals.

Duroy, a cheap kind of figured serge.

Dust-Brush, a light feather or hair brush for cleaning rooms and furniture.

Dust-Pan, a broad, flat, tin shovel, to catch crumbs, lint, or dust, as they may be brushed from a table-cloth or carpet.

Dutch-Carpet, a mixed material of cotton, flax, and wool, used for floor coverings.

Dutch-Cheese. See CHEESE.

Dutch Gold-Leaf (also called *brass-foil, bronze-leaf, Dutch-foil, Dutch-metal*), an alloy of copper and zinc, closely resembling common brass, but having rather less zinc in its composition than brass generally has. It is used for beating into thin plates resembling gold-leaf in appearance when new, and used for ornamentation instead of gold-leaf. It tarnishes readily, and may be tested by the application of strong nitric acid, which will not injure gold-leaf, but which readily dissolves the imitation. *Imp.* duty, 10 per cent.

Dutch-Oven, a tin hanging screen for cooking before a kitchen range or ordinary fire-grate. — In the U. States, a pot used in baking between hot coals.

Dutch-Pink, a painter's bright yellow color used in distemper, in paper-staining, etc. It consists of a mixture of clay and chalk, colored by French berries or birch-leaves, with alum. *Imp.* duty, 25 per cent.

Dutch-Rush, the horsetail or shave-grass, *Equisetum hyemale*, a plant which, from its hard and rough exterior surface, is found useful for polishing marbles, hard woods, ivory, brass, and other substances. The rhizomes are nutritious, and have been used as food in times of famine.

Dutch-Tiles, glazed and painted ornamental tiles; formerly much used to plaster up in the jambs of chimneys.

Dutiable, liable to duty; subject to the imposition of customs-duty.

Duty, a general name for a tax or impost; particularly, a sum of money required to be paid to a government on the importation, exportation, or consumption of goods or merchandise. — The amount of work performed by a steam-engine, or other machinery.

Duvet [Fr.], down or fine feathers.

Dwt., the abbreviation for pennyweight.

Dye, a coloring liquid or matter.

Dyeing, the art of coloring in a permanent manner porous or absorbent substances by impregnating them with coloring bodies. Most vegetable and animal bodies are porous or absorbent, and can be dyed; some minerals also, such as marble, can absorb liquid coloring matters; but the term *D.* is usually confined to the coloring of textile fibrous materials by penetration. Although many eminent chemists have worked and written upon the subject, there still remains much difference of opinion as to what actually takes place in *D.* operations. The following general account of the chief cases of *D.* will illustrate the principal methods in use, and serve as an introduction to a description of actual processes practised in dye-houses. The simplest cases of *D.* are those in which only two substances are employed, — the fibre to be dyed and the coloring matter, — and where the process of *D.* consists in nothing more than leaving the two materials in contact for a certain time at a convenient temperature. Of natural coloring matters few can be practically used in this simple way without some previous chemical treatment. The artificial coloring mattters from aniline, however, illustrate this kind of *D.* very well. To obtain the finest shades of mauve, magenta, purple, and numerous other colors upon wool and silk fibre, the whole process consists in placing the material in a solution of the requisite color and of sufficient quantity to give the desired shade; it absorbs the color, becoming dyed, while the solution is rendered nearly colorless. During the process the fibrous material is kept in a constant state of movement, so that the dye solution shall have equal access to all portions, the temperature employed and time allowed being regulated according to the necessities of the case. The color absorbed by the fibre has entered into an intimate state of combination with it, since it cannot be washed out again; a true *D.* has taken place. Besides the aniline colors, the older artificial dyes — sulphindigotic acid, picric acid, and one or two others — have the same property of combining directly with wool and silk. There are other cases of *D.* closely resembling the foregoing, in which the resulting dyed stuff may be considered as being a binary compound of fibre and coloring matter, but in which the methods of application are less simple. These may be taken generally as consisting in the use of materials or processes which bring a previously insoluble coloring matter into a soluble state; thus the pink colors of safflower are obtained by the action of an alkali; and the dyes yielded by archil, arnotto, and indigo are also the result of the action of solvents. It is possible that during the process of solution important internal changes may take place in the composition of the above dyes; but if so, they are only of a temporary nature, for there is no reason to suppose that the coloring matter attached to the fibre differs in chemical composition from that which is free. With regard to nearly all other coloring matters, the above simple processes are quite powerless to induce a permanent combination with the fibre. Let wool or silk be immersed at boiling temperature in decoctions of any of the best known natural dye-stuffs, such as cochineal, logwood, madder, quercitron bark, etc., and then washed in water, it will be found that the fibres are simply discolored, or stained of no definite shade; they have taken up but a small portion of color from the decoction, and no real *D.* has taken place. To obtain permanent dyes from the great majority of native coloring materials the intervention of another class of bodies entirely different from either fibrous or coloring matter is found necessary; these bodies are called *mordants*. The chief mordants used in *D.* are salts of aluminium, iron, tin, chromium, copper, and a few other metals. When a decoction of a coloring matter, say logwood or cochineal, is heated with a small quantity of a properly chosen salt of one of those metals, it is found that the coloring principle loses its solubility, forms a combination with the metallic salt or its bases, and precipitates to the bottom of the solution, leaving the supernatant liquid nearly or quite colorless. The precipitate is usually called the *lake* of the particular metal and coloring matter, which are probably in a state of chemical combination. Fibre cannot usually be dyed by means of ready formed lakes, for the reason that they are insoluble in water and not easily soluble in any menstruum which can be safely applied to such material; they are themselves of too coarse and gross a nature to penetrate the fibre, and when applied to it rest for the most part on the surface, and are therefore easily removable by washing or mechanical friction. It is known, however, that for some colors in calico-printing lakes can be applied, but that is only in conjunction with acid salts and at a high temperature, by means of which a sort of solution is obtained while in contact with the fibre itself. The art of the dyer consists in so arranging these three elements — fibre, metallic salts, and coloring matter — that he may obtain the formation of the insoluble colored lake in the body of the fibre itself, whereby

either by the lake being mechanically retained or chemically combined the fibre is permanently colored.

Application of Mordants. There are three principal ways in which the mordant and coloring matter can be put into contact with the fibre, the developments and modifications of which constitute the whole art of *D.* — 1 By the first method, which is by far the most common, the fibrous matter is separately impregnated with the mordant, which is by various means decomposed, so as to deposit its base in an insoluble state upon or within the fibre, and afterwards the coloring matter is applied Take, for instance, the case of *D.* a common black from logwood upon calico, which has no affinity for the coloring matter of the logwood. The first process is to pass the calico through a hot aqueous solution of sulphate of iron, sometimes mixed with acetate of iron, and to remove the excess by passing the cloth through rollers (Fig 147); the cloth, either previously dried or not, is then passed through a mixture of lime and water, which has the effect of decomposing the iron salts and liberating oxide of iron. A washing in water to remove the excess of lime, or any loosely attached oxide of iron, prepares the calico for coming into contact with the logwood. The calico, which has now a buff color, owing to the attached mordant of oxide of iron, when placed in a hot decoction of logwood speedily acquires a dark hue, and in about half an hour has become dyed of a dense black color, and, when smoothed and finished, forms the common black calico of the shops. — 2. A second method is to apply the coloring matter before the

Fig. 147. — Mordanting and Dyeing Process.

mordant in the dye-vat (Fig. 148). It is resorted to only with heavy goods, which absorb a great quantity of liquid, and with light colors upon other fabrics; dyes produced in this way are superficial in their character, and not so permanent as those produced by the first method. In *D.* by that method, it is in many cases customary to add a small quantity of mordant to the dye-bath when the process is quite or nearly finished, or to pass the dyed goods, as a final operation, through a diluted mordant. — 3. A third method is to apply the mordant and the coloring matter together to the fibrous substance In common piece *D.* in weak liquids this plan is seldom followed, on account of the tendency to form insoluble lakes in the solution, which, depositing only on the external part of the fibres, give inferior results, alike as to stability of color, depth of shade, and evenness or regularity of the dye. In calico-printing, or in padding, this method is of extended application, and the inconveniences experienced in common *D.* are not perceptible, owing to the greater concentration of the mordanting salts and the use of thickening matters.

Red Colors. The most important of the red colors produced by *D.* are obtained from cochineal and from madder, the former being used for woollen and the latter for cotton goods They are both old colors, and have arrived at their present excellence by slow degrees; they are deep and brilliant, and, as far as regards permanency, hold the highest position among all dyed colors. The processes employed are instructive, as illustrating the diversity of treatment required by different fibres and coloring matters.

Red upon wool from cochineal. Let it be assumed that the shade of red required is fine scarlet, and that the woollen cloth is of finest quality. The cloth first requires purifying from all the adventitious substances which it has acquired in the process of manufacture, in order to prevent irregularity and unevenness in the shade of color; this is done by methods described in the article Bleaching. The only materials required to produce a fast scarlet upon wool are oxide of tin and the coloring matter of cochineal, but it requires much practical skill to bring them into contact properly. After the cloth is cleaned, and while it is still wet from its last washing, it is mordanted by boiling it in a solution of a salt of tin with or without cream of tartar. The parts of the boilers not in actual contact with the fire are frequently constructed of pure block tin, or at least all parts out of water should be of this metal, or else protected by wood, or the *D.* vessels should be made entirely of wood and heated by steam-pipes; for, if the cloth containing the acid solution of tin comes in contact with a copper or brass surface, it acquires a stain which afterwards dyes up an impure color. What takes place in the course of boiling is that eventually a certain portion of tin, probably in the state of stannic oxide, becomes fixed upon or within the fibres of the wool, and this in a perfectly uniform manner The tin not in intimate combination with the wool, or held merely by capillary attraction, is washed off by water before the cloth is brought into contact with the coloring matter. The mordanted cloth is now brought into a boiler containing finely ground cochineal diffused through a sufficient quantity of water, to which it is usual to add some more tin mordant and tartar; the cloth is turned continually to prevent folds or creases from interfering with the free access of the dye to all parts of it. The contents of the boiler are heated to the boiling point, and in half an hour or so the liquid becomes nearly colorless, and the cloth is found dyed of a bright red — The above may suffice to furnish a general view of the procedure usually followed, and to illustrate the principles involved with regard to numerous other dyes besides cochineal. To give the general reader a further idea of certain operations practised in the use of that color (and the description applies more or less to others), the following particulars may be onted.

The tin mordant used for scarlet on wool. It is now 200 years since the discovery was made of the use of tin with cochineal for dyeing scarlet. It might be thought that by this time the exact kind and quantity of tin solution to be used would have been settled. There exists, however, the greatest diversity upon this point among practical dyers. The two salts of tin met with in commerce, designated by chemists stannous and stannic chlorides, have received various names from dyers. Crystallized stannous chloride is generally known as "tin crystal;" the solution of the same as "muriate of tin." A single muriate and a double muriate of tin are also distinguished, the difference being in the degree of concentration. Experience teaches the dyer that there are scarcely two dye-works in the world in exactly the same condition with regard to either water and air, or apparatus, or quality of materials, and that the nature and quantities of drugs, mordants, and dye-stuffs used, and the duration and temperatures of the operations which secure admirable results in one place are altogether unsuitable in another. It is, however, clear that by far the greater part of the variations introduced by practical dyers are not really founded upon necessity Thus, although the best colors can be obtained by the use of simple tin solutions manufactured on the large scale, in nine cases out of ten the operative dyer of scarlet insists upon preparing his own solution, and pretends that he employs special methods and preparations without which it would never be fit to use; and hence a countless number of tin solutions are in use. The solution of tin used by dyers for the scarlet, and for many other colors upon wool, silks, and cotton, are commonly called spirits, or *tin spirits*, a name which is very old, and appears to have originated in the use of nitric and hydrochloric acids to dissolve the tin, which acids were formerly, and are even at present, called spirits of nitre and spirits of salts.

Use of tartar along with tin mordant. The tartar of the dyer is a more or less impure form of the cream of tartar of the shops, or the acid potassium tartrate of chemists. It is in very general use for wool dyeing, and when employed with dye-stuffs plays the part of an acid, and could in fact be replaced by an acid; in other cases, when used in mordanting, it no doubt acts as a salt, contributing to neutralize the strong mineral acids of the mordant, and rendering them more ready to decompose in the presence of the cloth. In a particular receipt for dyeing scarlet the proportions of materials are as follows: 20 lbs of tin solution, containing about 20 ounces of metallic tin dissolved in nitric acid, with the addition of a little common salt, are used to 100 lbs. of woollen cloth. Of the 20 lbs of mordant, 13 lbs. are taken and mixed with a solution in water of 8 lbs of crude tartar, and about 8 ounces of cochineal are added, to enable the dyer to form a judgment of the progress of the mordanting. The ingredients having been boiled for a couple of hours, the cloth is rinsed in clean water and placed in another boiler, containing the residual 7 lbs. of mordant and 6 lbs. of ground cochineal, which are sufficient to dye up a full scarlet color; but if the scarlet is required to be very bright, or what is called "fiery" colored, a further quantity of tartar is added; this has the effect of somewhat reducing the depth of color, and at the same time giving it a yellowish or orange hue, which for certain purposes is much desired.

Use of yellow in scarlet. It appears that Bancroft, who wrote about the end of the last century, was the first to suggest that the bright fiery scarlet, which the dyers found they could best obtain by using a large quantity of tartar, might be

produced more cheaply by adding some yellow coloring matter to the cochineal, or by first dyeing the cloth a light yellow, he tried the yellow from quercitron bark, and succeeded as far, perhaps, as was possible with that material At any rate, from his time it has been customary for dyers who do not aim at the highest degree of excellence in the scarlet color to use a purified preparation of quercitron bark, commercially known as flavine, in conjunction with cochineal, other yellow coloring matters, such as fustic and turmeric, are also used An admixture of these substances cheapens the cost of the color, which can be made nearly equal in appearance to that obtained with cochineal alone, but it does not stand wear so well, and is more readily stained by various influences. The best scarlets are still dyed exclusively with cochineal.

Scarlets on wool from lac-dye. The coloring matter of lac-dye is, in its chemical properties and composition, very similar to, if not quite identical with, that of cochineal. As it is imported into this country from India, it is, however, less pure than average qualities of cochineal, and it is probably on account of its impurities that the dyer cannot obtain quite so good results as the best cochineal colors, although if skilful he may approach them very closely. Having been submitted to a preliminary treatment with acid, to free it from alumina and other earthy matters used in its preparation, it is then applied exactly in the same way as cochineal. It is extensively used for a second-class scarlet, and is believed to be somewhat more durable and stable even than cochineal.

Crimson red on wool. This color is also dyed with cochineal, but with a mordant of alum instead of tin. It is a far less important color than the scarlet, and compared with it is dull and flat; it is, however, rich and durable, and combines excellently with other colors.

The mordanting of cloth by means of alum, an operation of capital importance for a large series of colors derived from all varieties of dye-stuffs, must now be noticed.

Aluming of wool. The method of mordanting with alum, generally called aluming, is practically a simple process, but the chemical principles involved have given rise to much debate amongst experimenters. The aluming is usually performed by boiling the wool for one or two hours in a solution of common alum mixed with tartar; a certain portion of alumina, or, it may be, of some compound of aluminium, becomes thus intimately combined with the wool, and forms a basis upon which a colored lake may be produced with solutions of coloring matters. The chemical conditions are somewhat different here from those which obtain in the case of mordanting with tin, for the disposition of tin salts in dilute solutions to decompose even spontaneously is so manifest that it may readily be supposed that some action on the part of the wool takes place which induces the formation of oxide of tin. The wool being successfully alumed acquires a crimson color by dyeing in cochineal, but this shade is not of much value. The shade of red between scarlet and crimson reds proper, or cherry reds, are also dyed with tin mordant and cochineal in nearly the same way as the scarlet; but in order to avoid a yellowish tone, the natural cochineal may be mixed with the manufactured or modified material known as ammoniacal cochineal.

Pink or rose color upon wool. This shade is obtained from ammoniacal cochineal, mordanting previously in a mixture of tin solution, alum, and tartar; the quantity of tin mordant used is small, the alum being the essential basis.

Madder red upon wool. This color is wanting in brightness, but it is valuable for its stability. As a basis for browns, chocolates, and other dark colors, it is very suitable when its comparatively high cost is not an objection. To obtain madder red, the wool is boiled for two hours with a mixture of alum, tartar, and tin salt, — 3 lbs. alum, 1 lb tartar, and 4 ounces of the tin solution being taken for 10 lbs. of cloth. After boiling, the cloth is rinsed in water to remove uncombined mordant, and then dyed with madder, or preferably its derivative garancin, with addition of a portion of tartar; the dyeing may be accomplished in an hour, the depth of color varying with the amount of coloring matter used.

Artificial alizarin on wool. By employing artificial alizarin somewhat better shades of color can be obtained, and even pink colors of much solidity produced. A process for obtaining a fast red on woollen yarn, from alizarin, is as follows: Boil 10 lbs. wool for an hour and a half with 1½ lbs sulphate of alumina and ½ lb. tartar; rinse in water, and then dye with 6 to 7 ounces of artificial alizarin paste containing 10 per cent of dry matter: commence the *D.* cold, and gradually heat to boiling. Alizarin can be used as a basis for producing fast brown shades, by adding fustic and extract of indigo after the red has been developed, and if necessary, a further quantity of sulphate of alumina and tartar.

Aniline reds upon wool. There are several artificial red dye-stuffs which may be used for wool, but none possesses great excellence. The only one which resembles cochineal in its qualities is the recently discovered *eosine*; this, with an alumina mordant, gives upon wool a very good imitation of cochineal scarlet, but an imitation only, for the color fades rapidly in sunlight, and is easily washed out by soap and water. Substances similar to eosine, which have even still more recently appeared in trade, are called *coccine* and *nopaline*, they yield beautiful but perishable red colors on wool and silk.

Red colors on cotton.— Turkey red. Cochineal, which is so suitable a coloring matter for wool, does not dye satisfactory colors upon vegetable fibres; but from very remote times the Hindus have possessed a process for dyeing a brilliant and extremely permanent red upon fabrics by means of madder The name Turkey red, or Adrianople red, was applied to calico dyed with it at the time that such goods could be obtained only from the East, and it still retains the name. The dyeing of Turkey red upon cloth and yarn is now extensively carried on in Great Britain, and with great success. Turkey red is essentially a madder red with an aluminous basis, but differs from a common madder red by containing oil, and it is the fixing and combining of the oil with the fibre and the color which constitutes its peculiarity. Divested of details, the process of producing Turkey red may be divided into four stages: 1, the oiling of the cloth; 2, mordanting with a salt of aluminium; 3, *D.* with madder; 4, the brightening of the dyed color. The preparation of the cloth with oil is a process used in no other kind of *D.*; of its utility there can be no doubt, but all the attempts of chemists to explain the *rationale* of its action have failed. There are many modifications of the method of applying the oil, but the older and more commonly used process is to mix the oil with a dilute solution of potash or soda ash, so as to diffuse it uniformly through the liquid, forming an emulsion; the oil is not dissolved by the alkalies, nor is it supposed to combine with them, but is simply held in a state of excessively fine mechanical division. A low quality of olive oil is most generally used in Europe. Certain kinds of oil do not answer for Turkey red, only those being suitable which, probably from containing free fatty acids or albuminous matters, readily form a milky emulsion with weak alkaline solutions. The cloth to be dyed is steeped in the oily emulsion, wrung out, and dried in a warm stove; this process is repeated six or eight times, and the cloth is finally washed in weak alkali to remove from it all the oil not intimately united to the fibre. The result of this treatment, which is the most delicate and important in the Turkey-red process, is that the cloth becomes impregnated with a fatty matter, which, by the contact of alkalies and heated air, has undergone some change from its original state, which is usually called an oxidation, but the nature of which is really unknown. The cloth now possesses a power of attraction for mordants and coloring matters greatly superior to untreated cloth; and, further, its physical condition is changed so that colors upon it are more transparent and more vivid than upon ordinary cotton. The cloth in this state is ready for mordanting, which is done by passing it through a bath of alum, partly neutralized with carbonate of soda or by chalk, or in a bath of acetate of alumina, the object being to obtain a regular deposition of the albuminous base upon the fibre; the excess of mordant is carefully washed away from the cloth, which is now ready for *D.* The *D.* is accomplished in the ordinary way, by keeping the cloth in continual motion in a vessel containing heated water and the dye-stuff, which may be madder, garancin, or artificial alizarin. It is a very general practice to add a quantity of ox-blood to the water used in *D.* Turkey red. What purpose this fulfils is not known; its coloring matter cannot be supposed to be of any use; its albuminous constituents may have some useful action, but this seems very doubtful; probably its addition is quite superfluous, and is retained from older times, when *D.* was less understood than at present. When the *D.* is completed the color is a full and deep but dull red, which requires brightening. The brightening operations consist in removing brownish matters from the dye by boiling in soap and alkalies. To give a still more brilliant color, the goods are boiled for several hours in a closed copper boiler with a mixture of salt of tin with the soap used in the last process of brightening, — occasionally under a pressure greater than that of the atmosphere, in order to obtain a temperature some degrees higher than 212° F. In many processes of Turkey red *D.*, the cloth is treated with decoction of gall-nuts, or with sumach, after the preparation with oil and before the mordanting; this enables it more easily to absorb and fix the aluminous mordant, but it is not essential, and is most generally omitted No allusion has been made to a number of excrementitious and other animal matters, which the old dyers used in the oiling process, such as sheep-dung, cow-dung, ox-bile, etc.; they can be dispensed with, and were employed probably from caprice and ignorance.

Barwood red.— An imitation of Turkey red is obtained from barwood; it is much inferior both in beauty and stability to the real color, but the ease with which it can be dyed, and the less costly nature of the materials employed, enable it to be sold at a much lower price, and for some purposes it is largely used. Barwood is one of the red dye-stuffs of which the coloring matter is very slightly soluble in water; it is used in a state of fine powder. The cotton to be dyed is impregnated with a tin mordant by any of the means known to dyers, and then boiled with the dye-stuff; the coloring matter as it dissolves is fixed by the mordant, and the process is continued until the required shade is obtained. This wood, and a similar material called camwood, are also employed in woollen dyeing to give brownish reds, and to dye a "bottom" or foundation for indigo blue colors, by which some economy in indigo is effected, and a peculiar bloom on the blue is produced. — The class of woods

represented by Brazil wood do not yield good reds upon cotton.

Blue Colors. The most important of the blue coloring matters is indigo This may be said indeed to be the most important of all coloring matters, both as regards the large quantity and monetary value of what is produced and sold, and the permanence and solidity of the dyed colors which it yields. The indigo dye is a manufactured article, prepared in the place of growth of the plant which produces it. The indigo plant could itself be used for *D.*, but from 200 to 250 lbs. of it would be required to produce the effect of a single pound of the prepared indigo. In countries possessing a temperate climate, the species *Isatis tinctoria*, or woad, has been cultivated, and has been used from time immemorial for *D.* blue. Its comparative poverty in coloring matter has caused it long since to be disused by dyers as a source of color; it is, however, employed by them in the preparation of their indigo vats, but rather as a convenient material to induce fermentation than as a dye. Indigo is distinguished from nearly all other coloring matters by its complete insolubility *per se* in water and other ordinary solvents. It dissolves to a very slight extent in heated aniline, petroleum, and acetic acid, which upon cooling redeposit it; the only real solvent for it is anhydrous acetic acid mixed with a little sulphuric acid, from which water precipitates it unchanged, but this solvent is inapplicable in *D.* But solubility is an essential condition for *D.*, and means have been found to obtain satisfactory solutions of indigo by circuitous methods which involve the temporary destruction of its blue color and a change in its chemical composition. By various deoxidizing agents, indigo blue can be changed into a white substance, indigo white, which dissolves with facility in all alkaline liquids, forming a colorless or slightly yellow solution. On exposure to the air or other sources of oxygen the solution yields the insoluble blue indigo, and permanently dyes any fibre which has been saturated with it. This is the only case in which such a method of *D.* is applicable, and on that account it possesses much interest. We shall now proceed to describe some of the practical methods in use for indigo *D.*

Fermentation process. The oldest of these, and one naturally suggested by the method employed in preparing the dye-stuff, is the process of fermentation in contact with lime, or sometimes soda or potash. During this process, gaseous or liquid substances are formed, which have the power of reducing indigo from the blue to the white state, and fitting it for *D.* This ancient method has not been superseded, being employed at the present day for nearly all woollen goods dyed with indigo, the consumption of which is greater for woollen than for all other kinds of cloth.

The woad vat. To a course of lectures upon *D.*, recently delivered by Mr. Jarmain before the Society of Arts of England, we are indebted for the substance of the following account of the woad vat used by the Yorkshire dyers. The materials employed are indigo, woad, madder, bran, and lime. For this process, as for every other in which it is employed, the indigo must be reduced to the finest possible powder. It is generally ground mixed with water, in closed revolving cast-iron cylinders containing iron rollers or balls, for several days, or until the slime or pulp formed contains no visible particles of the dye-stuff. The proportions of materials employed are: —

Lincolnshire woad..................	5 cwt.
Wheaten bran......................	18 lb.
Slaked lime in dry powder..........	22 "
Madder............................	2½ "
Indigo............................	24 "

The woad is first placed in the *D.*-vat nearly filled with water, which is heated to between 140° and 150° F.; after some hours (required to soften the woad), the bran, madder, and indigo are added, and half of the whole quantity of lime. In a few hours, if all is right, signs of commotion produced by fermentation will be visible, the liquid will become greenish, and a blue scum will be visible on the surface; a piece of wool is put in as a test, and if in a short time it becomes dyed blue the process is proceeding well; a little more lime is added, but at intervals, so as not to check the progressing fermentation, and, if it should become necessary the vat is heated up by steam to its original temperature, on the third day the vat should be ready for *D.* Such a vat as this requires skilful management to control the fermentation; without lime the reduced indigo would not be dissolved; with too much lime the fermentation would be stopped. The woad acts as an easily fermentable matter, and furnishes a portion of blue color; the bran also no doubt is useful, on account of the ease with which it begins and promotes fermentation; the madder is probably of no use at all, its employment being still continued from an old unfounded notion that it gives some of its red coloring matter to the indigo-dyed goods, for the small amount of saccharine matter present in 2½ lbs. of madder cannot be held of any importance in the presence of 5 cwt. of woad. A woad vat, when ready for *D.*, consists of a certain depth of a tolerably clear solution of white indigo in lime, and a somewhat voluminous semi-solid mass at the bottom, consisting of the bulk of the woad, the excess of the lime, the insoluble part of the madder, and the impurities always present in indigo. To keep the cloth to be dyed from contact with the muddy bottoms, an iron hoop, of the internal diameter of the vat, covered with a network of open meshes, is lowered into it and secured at a safe distance from the bottom. The pieces to be dyed, after being well cleansed, are placed in the liquor, and kept in constant movement to insure full access of the color to all parts. The time required to dye, varying from 20 minutes to two hours, will depend upon the fineness and weight of the cloth, and upon the depth of color required; if the goods require it, they are dyed a second time. In moving the pieces about, they must not be brought above the surface of the liquid, for the oxygen of the air would restore the dissolved white indigo to its blue insoluble state. When the pieces are found to be sufficiently impregnated with the dye, they are withdrawn from the vat; at the moment of leaving the *D.* liquor they are seen to be of a yellowish color, which almost instantly changes into a bright green, then darker green, and finally becomes blue through the absorption of oxygen by the white indigo. Loose wool or yarn is dyed by enclosing it in an open and movable network bag. — The vat above described can of course dye only a limited quantity of material, becoming after every operation poorer in indigo; but it is not necessary to reset a vat. The strength of its contents is kept up by constant additions of indigo, lime, and bran, no more woad is added, the quantity used at first being sufficient for about its own weight of indigo. — This vat is called *warm vat*, being made and worked at a temperature considerably above that of the air, — a condition held necessary for *D.* wool and some kinds of heavy cotton goods For ordinary cotton *D.* the vat is used cold or at the ordinary temperature of the air, and is prepared in a quite different manner.

Prussian blue. The simplest method of employing it consists in first impregnating the material to be dyed with peroxide of iron, and then passing it into a solution of yellow prussiate of potash acidified slightly with sulphuric acid. Prussian blue upon silks is thus dyed The most convenient way of obtaining a deposit of the oxide of iron consists in soaking the silk in a somewhat strong solution of the ordinary dyers' nitrate of iron; in the course of two or three hours a certain quantity of the oxide is found to be intimately combined with the silk; the excess of the nitrate is then washed away, and the silk worked in the acidified prussiate bath, when it immediately assumes a light azure shade; by repeating the treatment several times any depth of color may be obtained. — Calico can be dyed in the same way, but both for that and for silk it is usual to add to the iron solution a small quantity of salt of tin, which is useful in giving a purplish tone to the blue and preventing the production of a disagreeable greenish tinge. — A deep color cannot in this way be satisfactorily given to woollen, for which a treatment is adopted depending upon the decomposition of the prussiate by means of heat and acids. For *D.* say 110 lbs of merino, the following proportions and methods may be used. Dissolve 9 lbs of yellow prussiate of potash in hot water, and add the solution to the required quantity of water; then add 14 lbs. sulphuric acid, 6 lbs. sal-ammoniac, and about 6 oz of crystals of protochloride of tin; the merino is placed in the mixture, and the temperature of the dye-bath gradually raised to the boiling point in five hours. The blue gradually formed on the cloth requires brightening in a fresh bath consisting of alum, persalt of tin, and cream of tartar, heated to nearly the boiling point. Red prussiate of potash is used in nearly the same way to dye dark Prussian blues upon wool, but as it is more easily decomposed than the yellow prussiate a weaker acid-bath suffices. These blues are frequently finished off with logwood to give them a deeper tone.

Aniline blues. There are several artificial blue dyes made from aniline and similar bodies which yield very brilliant colors on wool and silk. They can be easily applied, the goods simply requiring to be worked in their aqueous solution until they have acquired a sufficiently dark tinge. An artificial dye called Nicholson's blue is differently applied; it is dissolved in an alkaline liquid, and forms then a colorless or nearly colorless solution, with which the goods to be dyed are impregnated; they are then passed into dilute acids, which develop the blue color.

Yellow Colors. Yellow textiles, being less pleasing to the eye, and more readily soiled, are not nearly so much in use as those dyed with the two simple colors blue and red The chief yellow dyes, besides fustic, are quercitron bark or its concentrated extract, flavine, Avignon or Persian berries, and the now almost disused weld. The general mordant for these is tin, sometimes with addition of alum. One or two illustrations will suffice to show the methods of using them.

Fustic yellow. Fustic is probably the most generally employed yellow dye-stuff for wool, it gives yellows inclined to orange. For light shades it is not necessary to mordant the wool; it is simply well cleansed, and then heated with fustic decoction and some cream of tartar. For darker shades the wool is boiled with solution of tin and tartar, washed, and then worked in the decoction of fustic.

Picric acid yellow. Picric acid, one of the artificial coloring matters, gives pure though not deep yellow shades upon silks and wool without the aid of a mordant, the cleansed material being dyed by working it in a warm solution of the acid.

Chromate of lead yellow. The yellow most commonly used

for cotton goods is obtained by the use of salts of lead and bichromate of potash. The method of obtaining this color differs somewhat from any previously described. The cotton, having been properly bleached, is impregnated with a salt of lead, usually by employing a solution of the acetate or subacetate of lead. The goods are next passed into a milk of lime solution, to which it is prudent to add some acetate of lead, in order to prevent the lime from dissolving the oxide of lead at first precipitated; the result of the lime treatment is that oxide of lead is evenly fixed upon the cotton; the excess of lime and lead is then well washed away, and the goods are passed into a solution of bichromate of potash, where they quickly acquire a bright and deep yellow color, owing to the formation of the well-known pigment chrome yellow. To facilitate the combination, the bichromate of potash is mixed with as much sulphuric acid as suffices to liberate the whole of its chromium as chromic acid. The yellow-dyed goods require no further treatment than a good washing, the color being quite fast. This yellow is, however, in very little demand, and in ninety-nine cases out of a hundred it is immediately converted into an orange, by passing it through boiling lime-water, which produces the basic chromate known as chrome orange, which has always been in demand for many articles of wear.

Compound Colors.

The so-called simple colors — red, blue, and yellow — having now been dealt with, it remains to treat of their combinations, and this may be done briefly, the processes employed being for the most part similar to those already described. The compound shades in Chevreul's chromatic nomenclature amount to nearly 15,000, and it is very probable that fully that number are produced by the dyers of the present day. For practical treatment, however, the compound colors can be reduced to comparatively few classes. Mixing the simple colors one and one we obtain three compound colors, — blue and yellow give green, blue and red give purple, yellow and red give orange; while there may be a normal green, purple, and orange, it is evident that all the varieties of these several colors will depend upon the proportions of their constituents. If the three simple colors be mixed together, say in equal proportions, we may get a normal brown, or even a black; but if in unequal proportions, an immense number of shades, varying from the imagined normal brown to gray and drab are produced. Although in many cases compound shades are produced by means of two or more simple colors, there are many natural as well as artificial dye-stuffs which yield them ready formed, and frequently purer than they can be otherwise obtained. Most of these will be found mentioned in the following brief notice of practical processes in use.

Green Colors. — *Lo-kao or Chinese green.* Until about the middle of the present century there was not an instance known of any green on textiles which was not composed of the two separate colors blue and yellow. About that time some green-dyed cottons, imported into France from China, attracted the attention of chemists, who were surprised that they could not separate the green into blue and yellow constituents. Inquiries showed that the Chinese employed a green coloring matter called Lo-kao, until then unknown in Europe. It was a costly dye-stuff, selling in China for its weight of silver. Some quantity of it was imported and used in silk-*D.* by the French; it was not, however, found altogether satisfactory, and has at length been quite abandoned for the aniline greens, which are in every respect preferable.

Aniline green. There are two or three kinds of artificial green dyes in use, of which that known as methyl-aniline green, applied in silk *D.*, is most in request. The so-called iodine green has also been somewhat extensively employed for all kinds of fabrics. These artificial and unstable materials are the only dye-stuffs for green possessed by the dyer, who is compelled to produce the color by means of blue and yellow elements. The arsenical mineral green and the oxide of chromium green may be just mentioned as of extremely limited employ. The blues used in *D.* green are indigo, Prussian blue, and the sulphate of indigo. The yellows are afforded by Persian berries, quercitron, fustic, or the yellow chromate of lead. The processes employed consist, for the most part, in the separate application of the blue and yellow; for example, in *D.* a fast green upon wool from indigo and any of the yellow dye-stuffs, the blue is first produced as previously described, and the proper mordant for the yellow is then applied to the cloth, which is afterwards placed in the yellow coloring matter; the two colors are so intimately mixed as to be indistinguishable even by high magnifying powers. It may be observed that the reception of the blue does not to any perceptible extent diminish the power of the cloth to combine with the yellow.

Prussiate green. Prussian blue is employed as a basis in the same manner, only, not being capable of resisting chemical agents so well as indigo blue, it demands more care. The greens with Prussian blue bases are more lively than those made with indigo, but are not so fast. Sulphate of indigo is even less stable than Prussian blue. It is, however, cheap and easy of application, and gives rich colors. The greens made with chromate of lead are for the most part confined to cotton goods, and are not in much demand

Orange Colors. — For cotton the chief orange dye is the chromate of lead compound already described. For other materials the orange colors employed are nearly always composed of some of the red and yellow dyes mentioned in the preceding pages, such, for instance, as cochineal and fustic, which are applied in one bath, the same mordant serving for both.

Arnotto orange. A warm solution of arnotto in weak alkalies is used without mordant to impart to silk an agreeable orange shade. Its color is generally considered too yellow, but may be made redder by treatment with weak acids, or by previously giving the silk a light red foundation.

Picric acid orange. Another orange on silk can be dyed by superimposing on a light pink a yellow obtained from picric acid.

Nitric acid orange. Silk can also be permanently stained of a yellowish orange by means of moderately strong nitric acid, which must, however, be applied with great care, since a more than momentary contact would be very injurious to the strength of the fibre. This method of dyeing silk was formerly much used for handkerchiefs; by protecting certain parts from the acids with melted wax or similar resists, white designs were produced upon an orange ground.

Purple Colors. — The purple colors may be held to include all shades produced by an admixture of red and blue, such for example as lilac, violet, mauve, etc , and are of immense variety.

Aniline purples. Since their discovery aniline colors have been almost exclusively employed for dyeing silk and wool purple, yielding as they do shades which for lustre and purity surpass any obtainable from the older coloring matters, and possessing also a fair amount of stability. An aqueous solution of the dye without mordant is all that is required, and the goods when dyed need very little subsequent treatment. The aniline purples, violets, and mauves do not dye upon cotton without previous mordanting, and even then are so loose and unstable that they are only fitted for use where great fixity is not demanded, as for linings of clothing, etc. The most general mordant for the aniline purple colors on cotton consists of a tannate of tin obtained by first steeping the cotton in a solution of tannic acid, or in decoction of gall-nuts, sumach, or myrobalans, all of which contain tannic acid; after a few hours' contact a considerable quantity of tannic acid has become firmly attached to the cotton, and the goods, being now treated successively with stannate of soda and dilute sulphuric acid or in other ways, acquire a certain proportion of oxide of tin, and are prepared to receive the colors.

Madder purple. But the purple color *par excellence* upon cotton is obtained from madder or alizarin, the mordant being oxide of iron or a sub-salt of iron deposited on the fibre by treatment with the commercial pyrolignite of iron, commonly called iron liquor. This purple is remarkable for great permanency. It is very largely used in combination with black and white in the best kind of printed calicoes.

Archil purple. Archil and cudbear are sources of purple colors on wool and silk. The shades produced are rich and beautiful; they are not, however, very permanent, and have been nearly superseded by the aniline colors. Of the few instances that can be cited of stuffs dyed purple by the direct union of red and blue coloring matters, the violet or purple woollen cloth used for ecclesiastical purposes is an example. The indigo color is first fixed and cleansed, and then the cloth is dyed with cochineal and tin mordants in the way already described for dyeing scarlet. The purple thus obtained is a fast color, but is very costly, and on that account is not much worked — The common shades of purple, violet, lilac, etc., upon wool are obtained from logwood with a mordant of alum and tartar; the red woods are sometimes employed in conjunction with logwood for these colors, which are "topped" with archil to give them more brilliancy.

The extensive range of colors, comprising all the shades of brown, bronze, chocolate, nut, wood, drab, and gray, which may be considered as compounded of the three elementary colors, some one of the three predominating, can only be briefly treated of in this article. Most of them are actually produced by the use of dye-stuffs yielding the three simple colors; but there are coloring matters like catechu, which themselves yield brown colors, and others, such as logwood, which may be held to contain two or more of the simple colors, the blue predominating. A few illustrations will show how these triply compounded colors are produced by the dyer.

Brown Colors. — *Bronze brown on wool.* The wool is mordanted with alum and tartar in the usual way, and is then dyed in a mixture of fustic and madder or other equivalent red and yellow dye-stuffs; for fast colors a blue part can be communicated to it by the indigo vat. For a lower class of colors no indigo is used, but instead, a mixture of yellow wood (fustic or quercitron) with madder for the red, and logwood for the blue part: or again, the sulphate of indigo may be employed for the blue.

Tan brown. The wool is mordanted by boiling it for an hour with one per cent of its weight of bichromate of potash; it is then washed, and transferred to the dyeing vessel, with the following percentages of its weight of materials: madder, 3.2; fustic, 4.8; camwood, 2; barwood, 1.75; sumach, 2.1; with these materials it is boiled for two hours.

Dark drab. The weights required to dye 100 lbs. wool, pre-

viously mordanted with 1 lb. of bichromate of potash, are as follows: camwood, 6½ lbs.; sumach, 2 lbs.; madder, 2½ lbs.; fustic, 4 lbs.; logwood, 2½ lbs.; boil for one hour and a half, and afterwards, to darken the color, pass into water containing 1 lb. of sulphate of iron.

Black Colors. Black, from a dyer's point of view, is compounded of the three simple colors, red, yellow, and blue, in a state of concentration; but in reality the blue predominates in all good black colors, and gives them their density and at the same time their lustre. What is called a dead black, crape black, or jet black, is the nearest approach to a neutral black, but even this would be brownish if the blue did not predominate. It is often extremely difficult to obtain a black dye to suit a particular market. Of ten pieces appearing equally black to the uninitiated, an expert would, perhaps, pronounce one to be sooty, another purple, another red, another brown, another green, and so on. We should have to go back some years in the history of *D.*, to find a time when black was actually dyed with the three elementary colors. In some processes blue from indigo was first applied, and then, upon an alum mordant, red and yellow from madder and weld respectively; such a color was unexceptionable for stability, but its great cost caused it to be disused. At the present day, logwood is the chief dyestuff for blacks upon wool or cotton, and gall-nuts and other astringents for silks. Aniline black, on account of obstacles to its application, cannot be said to have yet established itself in *D.* proper, though it is much and highly valued in calico-printing.

Black dye upon silk. Silk easily takes a black by treatment first with decoction of gall-nuts, and subsequently with a salt of iron. For blue-blacks the silk is usually first dyed with Prussian blue, and then with gall-nut black. Extract of chestnut-wood with an iron mordant gives a good black. In modern black silk *D.*, materials are heaped upon the fibre which are not necessary to its color, but which increase its weight in an extraordinary manner, so as not only to compensate for the loss of 25 per cent of natural gum in the silk, but even, in some cases, to double or treble the original weight. The silk is, of course, much injured by the accumulation of foreign matters upon it, the fibre becoming harsh and brittle, and soon showing the effects of wear. The chief substances used for weighting are lead salts, catechu, iron, and galls, with soap or fatty matter, to soften in some degree the harshness these occasion.

Fig. 148. — Dye-Vat.

Black upon wool. Upon woollen cloth of fine quality, the black is dyed upon a basis of indigo blue, and, from the use of woad for this color, such blacks are in England called "woaded blacks." The first process, therefore, in producing the best black is to dye the wool in the indigo vat of a tolerably deep shade of blue, and afterwards boil it in a mixture of logwood and sumach, treating it with sulphate of iron, the latter process being two or three times repeated, a very perfect and durable black is obtained, provided the indigo basis is sufficiently deep, and only a minimum quantity of logwood has been employed, say about one fourth the weight of the sumach.

Common black. Common blacks upon wool have no indigo in their composition, but are dyed chiefly with logwood and iron salts; the wool and logwood are heated together for some time, and then sulphate of iron is added to the dye-bath. In other blacks of somewhat better quality, the woollen is boiled for some time with solution of iron, copper, and aluminium salts, together with tartar, and when the mordanting oxides have been fixed, the color is dyed up in logwood. The bichromate of potash mordant can also be used for the black dye, and the cloth can be "bottomed" with camwood or barwood; it is then dyed up with logwood, to which fustic or sumach may be added.

Black upon cotton. Almost the only ordinary black in cotton dyeing is obtained from logwood with iron mordant; sumach is sometimes used, and very rarely the black is dyed upon an indigo blue basis by means of sumach or galls and iron. As before stated, aniline black has not yet been practically applied in dyeing cotton. A common method is to first heat the goods for some hours with decoction of sumach, wash mordant in sulphate of iron, and then dye in logwood; another method consists in fixing an iron basis upon the cotton by the method given above, and *D.* in logwood, along with a portion of sumach or fustic, according to the shade required.

Velvet dyeing. The most important branch of black *D.* upon cotton goods is that employed for cotton velvets and velveteens, in which it is desired to produce a rich lustrous effect; the process is long, tedious, and uncertain, consisting of successive applications of sumach, sulphate or acetate of iron, sulphate of copper, logwood, and fustic, — the end chiefly aimed at being the production of a black with blush or violet bloom.

Dye-Kettle, in hat-making, the vat of dyeing liquid in which the crate of hats on their blocks is repeatedly dipped and aired to confer the requisite depth and gloss of color. It contains a solution of sulphate of iron, verdigris, and logwood, and is maintained at 180° F. — *E. H. Knight.*

Dyestuffs, a collective trade name for the coloring materials used in dyeing. See Dyeing.

Dye-Vat, a beck, or tub (Fig. 148), in which goods in piece or otherwise are saturated with a dye or a mordant in solution.

Dye-Woods, barwood, Brazil-wood, Campeachy-wood, camwood, fustic, and other woods used by the dyer and stainer, usually cut and ground, to extract colors from.

Dyke. See Coal (and Fig. 85).

Dynameter, an instrument for ascertaining by a simple process the magnifying power of telescopes.

Dynamics, a science which has for its object the investigation of the laws and principles which govern the action of forces.

Dynamite, an explosive preparation, consisting of a mixture of 75 parts of nitro-glycerine incorporated with 25 parts of a silicious infusorial earth. Ignited in the open air, *D.* burns slowly, but it is readily exploded as nitro-glycerine itself by means of a detonating fuse; and, though not equal in bursting or breaking power to uncombined nitro-glycerine, on account of the absorption by its inert constituents of part of the heat developed by the exploding shock, it is greatly superior to gunpowder, instead of which, or gun-cotton, it is employed in blasting coal and stone, removing piles, felling trees, and clearing stumps from forest land. Confinement is not requisite for the explosion of *D.*, and it can be used in damp situations without to any great extent impairing its action. It explodes if heated in a closed brass case, also on sharp percussion, when placed between two metallic surfaces; it should not, therefore, be kept in hermetically sealed receptacles of metal or other very solid material. At a low temperature *D.* loses its tendency to explode by detonation. Another defect is its liability to part with a portion of its nitro-glycerine, especially when in contact with porous substances, such as the paper of cartridges and wrappers. — Another preparation consists of 20 to 25 parts of nitro-glycerine with 75 to 80 parts of finely pulverized burnt clay from glass-works; and in some explosives sold as *D.* a mixture of sawdust and chalk is substituted for silicious substances.

Dynamometer, a name applied to any instru-

ment or apparatus which measures energy exerted or work performed. Fig. 149 shows a *D.* con-

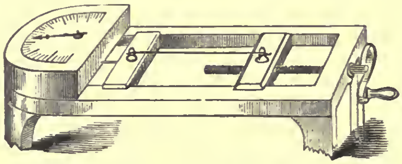


Fig 149. — Dynamometer.

structed for trying the tenacity of a rod. It consists of a heavy iron frame, at one end of which is a box containing a stout steel spring. A pointer connected with this spring moves over a graduated arc on the top of the box. On the frame are two movable blocks or slides, one of which is attached to the spring, while the other may be carried backward and forward by a screw and crank. The rod whose tenacity is to be tried is stretched between the two slides, and the crank is then slowly turned so as to pull upon the rod until it breaks. The force thus brought to bear upon the rod bends the spring; and the position of the pointer when the rod breaks shows how much force it took to break it.

E

Eagle, the principal gold coin of the U. States, which is a legal tender for $10. The eagle was authorized to be coined by act of April 2, 1792; weight, 270 grains; fineness, 916⅔. By act of June 28, 1834, the weight was changed to 258 grains, and the fineness to 899.225; and by act of Jan. 18, 1837, the fineness was again changed to 900. The half-eagle, the most common gold coin of the States, and the quarter-eagle, were authorized and modified by the same acts, and are of proportional value. The double-eagle, legal tender for $20, was authorized to be coined by act of March 3, 1849; weight, 270 grains; fineness, 900. The total amount coined to close of fiscal year ended June 30, 1878, was: *Double-eagles*, $861,001,780; *eagles*, $56,862,710; *half-eagles*, $70,101,495; *quarter-eagles*, $26,933,600.

Eagle Fire Insurance Co., located in New York City, organized in 1806. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $300,000; net surplus, $507,411.68; total cap. and surplus, $807,411.68. Risks in force, $25,420,170; premiums, $97,293.32; premiums received since the organization of the Co., $5,379,226.46. Losses paid, $2,687,379.16. Cash dividends paid to stockholders, $3,506,308.

Eagles' Feathers have a commercial value from being used in millinery, and the large quills for making artists' hair-pencils, etc.

Eagle-Stone, a description of clay iron ore.

Eagle-Wood. See Aloe-Wood.

Earing, a rope attached to the cringle or ring of a ship's sail, by which the sail is bent or reefed.

Earnest, the sum paid by the buyer of goods in order to bind the seller to the terms of the agreement. To constitute *E.*, the thing must be given as a token of ratification of the contract, and it should be expressly stated so by the giver. After *E.* given, and what may be its amount, the vendor cannot sell the goods to another without a default in the vendee, and, therefore, if the latter does not come and pay, and take the goods, the vendor ought to go and request him, and then, if he does not come, pay for the goods, and take them away in convenient time, the agreement is dissolved, and he is at liberty to sell them to any other person.

Earnings, wages gained for work or labor done; profit made.

Ear-Pick, a small instrument for cleansing the ear of the cerumen.

Ear-Ring, a jewel or ornament suspended from the ear by a gold or other ring passing through the lobe. The use of this kind of ornament, which constantly was of great value, and sometimes was made of large size, dates from the remotest historical antiquity, the earliest mention of ear-rings occurring in the book of Genesis. These ornaments, which never have fallen into disuse, and enjoy at the present time a very high degree of favor, appear to have always been worn in pairs, the two ornaments in all respects resembling each other.

Ear-Shell, a flattened, univalve species of Haliotis, much prized for the enamelled iridescence of its inner nacreous coating, which renders it useful for inlaying papier-mâché work, etc.

Earth-Board, the mould-board of a plough; that which turns over the furrow.

Earth-Closet, a night-stool in which a body of earth receives the deposits, or is dropped upon them to absorb the effluvia; the resultant being to be utilized as a fertilizer.

Earthenware, a term generally applied to all utensils composed of earthen materials. In reference to chemical constitution there are two kinds: *Porcelain*, consisting of a fusible earthy mixture, along with an infusible, which, when combined, are susceptible of becoming semi-vitrified and translucent in the kiln; and *Pottery*, an infusible mixture of earths, which is refractory in the kiln, and continues opaque. The latter comprehends several sub-species, which graduate imperceptibly into each other, as stoneware, earthenware proper, flintware, fayence, delftware, and ironstone china. See Porcelain and Pottery.

Earth-Nut. See Peanut.

Earths, the name given in chemistry to a group of metallic oxides. The principal earths are baryta, strontia, lime, magnesia, alumina, berylla or glucina, yttria, zirconia, and thoria. The first four are termed *alkaline earths;* the remainder, together with the oxides of the very rare metals erbium, terbium, norium, cerium, lanthanum, and didymium, constitute the *earths proper*. The term "earth" was very loosely applied by the older chemical and pharmaceutical writers, and the practice is still common among the vulgar at the present day. Thus, *absorbent E.* (chalk), *aluminous E.*, *argillaceous E.* (alumina), *bolar E.* (bole), *bone E.* (phosphate of lime), *Fuller's E.* (an absorbent clay), *heavy E.* (baryta), *Japan E.*, or *terra Japonica* (catechu), *sealed E.* (bole), etc., are names even now frequently encountered both in trade and in books.

Earthwork, an engineering term applied to cuttings, embankments, etc.

Earthworm Oil, a green medicinal oil obtained from the common species of *Lumbricus*, and used as a remedy for ear-ache.

Ear-Trumpet, an instrument for the relief of defective hearing. It is made of metal, — silver or gong-metal being considered the best, — and it is curved in form, one end being small enough to enter the ear, and the other bell-shaped, and expanding outwards like the mouth of a trumpet, whence it derives its name. It is curved (Fig. 150) in order to collect the rays of sound, and oblige them to converge by reflection on the membrane of the drum of the ear, like rays of light collected in a focus by means of a lens. The collection of the rays of sound causes them to act on the drum of the ear with greater power. There are many different kinds of *E.-T.* differing from each other in construction, but being all made on the same principle, — to collect and concentrate the rays of sound. Some are very small, such as the auricle and ear-cornet, and can be worn in the ear, or attached to the head by elastic springs; others are made of india-rubber, in the form of long tubes, with a bell-shaped opening at one end like the metal instruments. There are also artificial *membrana tympani*, or membranes of the drum of the ear, made of vulcanized india-rubber, which are introduced into the orifice at the end of a piece of silver wire, and are found extremely

Fig. 150.—Ear-Trumpet.

useful in cases where deafness arises from perforation of the natural membrane.

Easel, a painter's wooden frame, or rest, with a movable ledge, on which the canvas is supported for painting (Fig. 151). An *Easel-picture* is a picture of small dimensions, such as render it portable.

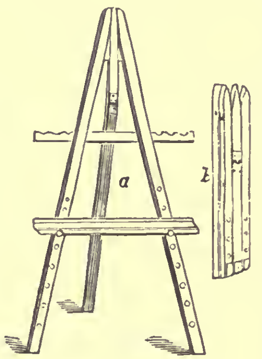


Fig. 151.—Easel.

East [Fr. *est;* Ger. *Ost*], one of the four cardinal points, being that point of the horizon where the sun appears to rise when in the equator. The word "East" is indefinitely used when we speak of countries which lie eastward of us. The eastern parts of the earth, or Oriental countries generally, as regards Europe, are commonly called *The East.*—*East by North*, or *by South*, that point of the compass which lies 11¼° to the N. or S., respectively, of the point due E.—*East-northeast, East-southeast* (E. N. E., E. S. E.), that point of the compass which lies 22½° to N. or S. of east, or midway between N. E. or S. E. respectively.

Eastern Islands. See Malayan Islands.

Eastern R.R., of Massachusetts, runs from Boston, Mass., to State line, N. H., 41.390 m; branches, 76.596 m.; leased lines, 163.980. This Co, whose offices are in Boston, was chartered in 1836, and was completed from Boston to the N. H. State line in 1840. Its branches are from Salem to Marblehead, 4 m.; from Beverly to Gloucester, 17.35 m.; from Salisbury to Amesbury, 3.75 m.; from Revere to Lynn, 9.52 m.: from Peabody to Wakefield, 8.12 m.; from Salem to Lawrence, 19.66 m.; from Hamilton to Asbury, 1 m.; from Wenham to Essex, 5 m.; from Swampscot to Marblehead, 3.8 m.; Charlestown br., 1.09 m. The Co. leases the following lines: The Eastern R.R. of N. H., 15.90 m.; Newburyport City R.R., 2.80 m.; Portland, Saco, & Portsmouth R.R., 51 m.; Portsmouth & Dover R.R., 10.88 m.; Portsmouth, Great Falls & Conway R.R. 71.37 m.; Wolfeboro' R.R., 12.03 m. *Financial statement:* Cap. stock, $4,997,600; funded debt, $13,587,021 99, consisting of mortgage funding certificates, issued 1876, $13, 165,619.46, payable 1906, interest (May and Sept.) 3½ % for first 3 years, 4 % for next three, and 6 % for ensuing years. Various securities exchangeable for certificates, interest having stopped since 1876, $227,002.54; Essex R.R. 1st mortgage bonds extended (issued 1856, payable 1896), $194,400, interest (May and Sept.) 6%. Net earnings for 1878, $841,268.25.

East India Company (The), the most celebrated commercial association either of ancient or modern times, was incorporated during the reign of Queen Elizabeth, 1600, and empowered to trade to countries to the eastward of the Cape of Good Hope, exclusive of all other persons. Properly speaking, the company were only merchants, sending out bullion, lead, quicksilver, woollens, hardware, and other goods to India; and bringing home calicoes, silks, diamonds, tea, porcelain, pepper, drugs, saltpetre, etc., from thence. Not merely with India, but with China and other parts of the East, the trade was monopolized by the company; and hence arose their great trade in China tea, porcelain, and silk. By degrees, avarice and ambition led the company, or their agents in India, to take part in the quarrels among the native princes; this course gave them power and influence at the native courts, from whence arose the acquisition of sovereign powers over vast regions. India thus became valued by the company, not only as commercially profitable, but as affording to the friends and relations of the directors opportunities of making vast fortunes by political or military enterprises. Many and severe have been the contests between the advocates of free-trade with India and the friends of the "incorporated company"; but at length the long-supported monopoly of that powerful body was abolished by the British government in 1833; and by act of 1858 the whole of the company's powers were transferred to the Crown.

East Indies [Fr. *Les Indes-Orientales*], a collective term vaguely applied to Hindostan, Farther India, and the Malay archipelago. See India (British), and Malayan Islands.

Easton and Amboy R.R. runs from Easton, Pa., to Perth Amboy, N. J., 60 m. This Co., whose offices are in Philadelphia, was chartered in 1872. The road was opened in 1875 and was constructed by the Lehigh Valley R.R. Co., to extend their main line to the seaboard. Cap. stock, $5,000,000; funded debt, first mortgage 6 % bonds, $5,000,000.

East Pennsylvania R.R. runs from Reading to Allentown, Pa., 36 m. This Co., whose offices are in Philadelphia, was chartered in 1857, and the road opened in 1859. It was leased in 1869 to the Phila. and Reading R.R. Co., for a term of 999 years, at a rent consisting of interest on bonds and 6 % on capital stock. *Financial statement:* Cap. stock, $1,709,550; funded debt, 1st mortgage, 7 % 30-year bonds, payable 1888, $495,900. Profit and loss, $161,654.61. In 1878, two dividends of 3 % each were paid, amt. to $110,033.

East River communicates with the Hudson in the Bay of New York, and is formed by the narrowing of Long Island Sound, which opens with a broad mouth at the eastern end into and receives a strong impulse from the tides in the Atlantic. This channel is so called in contradistinction to the North River (the Hudson). As the Sound contracts to the west of the broad expanse in front of New Haven, and forms what is called *East River*, the oceanic currents act with a force that increases with the diminishing width of the stream; and this causes higher tides here than at any other place around the island, arriving at New York about three quarters of an hour earlier than those by the Narrows. This current drives upward along the east shore of the Hudson many miles in advance of the other, on the west; and thus the Hudson has two tides, which hardly unite their action till they have passed Tappan and Haverstraw bays.

East River Bridge. See *Appendix.*

East Tennessee, Virginia, and Georgia R.R. runs from Bristol to Chattanooga, Tenn., 242 m.; Branch, Cleveland, Tenn., to Dalton, Ga., 30 m.; total 272 m. This Co., whose offices are in Knoxville, Tenn., was organized in 1869 by the consolidation of the East Tenn. and Virginia R.R., and East Tenn. and Georgia R.R. It also owns the Cincinnati, Cumberland Gap, and Charleston R.R., is interested in the Western N. Carolina and Rogersville and Jefferson R.R. It has also leased for 20 years from 1877 the Memphis and Charleston R.R. Cap. stock, $1,967,074; funded debt, $4,186,100.

Easy, not pressed for money; the money market is said to be *easy* when the rates of interest are low and money readily borrowed on personal securities. — *T. McElrath.*

Easy-Chair, a luxurious padded or cushioned arm-chair, adapted for ease or rest.

Eatable, anything that is fit or proper for food; any edible substance; that which is used for food.

Eau. This French word, like *water*, its English synonyme, is applied to numerous substances, differing in their composition, sensible properties, and uses, of which the following are a few useful examples: *E. douce*, fresh or river water; *E. de mer*, sea or salt water; *E. de fontaine*, *E. de source*, spring water; *E. de puits*, well or pump water; *E. de rivière*, river water; *E. de distillée*, distilled water; *E. de rose*, rose water; *E. de vie*, brandy; *E. de Hongrie*, Hungary water; *E. bénite*, holy water; *E. forte*, aquafortis; *E. de savon*, soap-suds; *E. de senteur*, scented water, etc.

Eau Athénienne, for cleaning the head and removing scurf, is an alcoholic solution of potash-soap with some solution of potash and aromatic oil.

Eau de botot, a mouth-wash, is a mixture of tincture of cedar-wood, 500 grammes; tincture of myrrh and tincture of rhatany, of each 125 grammes; peppermint oil, 5 drops.

Eau de Cologne (Cologne Water), a perfume, so named from the city of Cologne, where its manuf. was first established by an Italian, Giovanni Maria Farina, born in 1685, and by other members of his family, some of whom made it according to a method due to one Paul Feurinis. In 1879 there were in Cologne 35 establishments for the preparation of the perfume, 28 of which were in the hands of persons bearing the name of Farina. *E. de C.* consists of a solution of various essential oils in strong alcohol. The purity and thorough blending of the ingredients are of the greatest importance in the process of manufacture. It was first manufactured by making a spirituous infusion of certain flowers, pot-herbs, drugs, and spices, and adding thereto, after distillation, definite quantities of several vegetable essences. *Imp.* duty, 50 per cent.

The best receipt for *E. de C.* is as follows: Take dried rosemary, thyme, sweet marjoram, wormwood, balm, and hyssop, 1 oz. each; cloves, cinnamon, angelica root, juniper-berries, anise, cummin, fennel, and caraway-seeds, fresh orange-peel, and oil of bergamot, 1 oz. each; cardamoms, lavender-flowers, and bruised nutmegs, each 2 oz.; the whole to be digested in 10 quarts of alcohol several days, and then distilled to dryness by water-bath. Purity of the ingredients, and freedom especially of the alcohol from fusel-oil, are essential to the perfection of the perfume.

Eau de la Florida, a colorless fluid with a greenish-yellow deposit consisting of sugar of lead, 50 parts; flowers of sulphur, 20 parts; distilled water, 1,000 parts.

Eaux, in perfumery, are solutions of the fragrant essential oils in spirit, as eau de Cologne, etc.; or they are distilled waters, largely charged with the odorous principle of plants, as eau de rose (*rose-water*), etc. — *Eaux*, of the liqueur-manufacturer, are aromatized spirits or cordials.

Eaux Médicinales are either simply watery solutions (*Hydrolés*), or distilled water (*Eaux distillées*); or they are vinous or alcoholic tinctures or solutions of essential oils, aromatics, or more active drugs. See CORDIALS, HAIR-DYES, PERFUMERY, SPIRITS, TINCTURES, WATERS, etc.

Eaves, the lowest tiles, slates, etc., of the roof of a house, which usually project over the side walls and throw off the water.

Ebauche [Fr.], a rough draught or sketch.

Ebauchoir [Fr.], a large chisel used by statuaries to rough-hew their work.

Ebb, the reflux or return of the tide after it has reached its full flood; *ebb tide* being the receding tide towards low water.

Ebéniste [Fr.], a cabinet-maker.

Ebonite. See VULCANITE.

Ebony [Fr. *ébène*; Ger. *Ebenholz*; It. *ebano*], a hard, durable, black-colored wood, obtained from different species of *Diospyros*, a large tree, found in tropical countries, especially in India, the Malayan Islands, etc. That which is considered to be of the best quality is the *D. ebenus*, a native of the Mauritius, Ceylon, and Madagascar; being jet-black, astringent, and of an acrid, pungent taste. Ebony, besides its other qualities, is susceptible of an elegant polish or lustre, and has always been held in high estimation; it is at present chiefly used for inlaying, for making rules and scales, as not being liable to warp, and for other purposes in turnery; but it is in less request now than formerly for cabinet-making, cheaper woods, dyed black, particularly that of the pear-tree, being commonly substituted for it.

Ebullioscope, an instrument for determining the strength of a liquid by ascertaining its boiling-point.

Ebullition, the state of boiling, or the agitation of a liquid arising from its rapid conversion into vapor by heat. *E.* occurs in different liquids at very different temperatures, such temperatures being called their *boiling-points*. Under the same circumstances the boiling-points are constant, and by observing them the chemist is often able to distinguish liquids which much resemble each other. The boiling-point of the same liquid may, however, vary considerably under different circumstances. The causes which induce variation are increased or diminished atmospheric pressure, the greater or less depth of the liquid, and the character of the containing vessel. Thus boiling water is colder by some degrees when the barometer is low, in bad weather, or at the top of a hill, than when the barometer is higher, in fine weather, or at the bottom of a valley or mine. There is a very simple and beautiful experiment, illustrative of the effect of diminished pressure in lowering the boiling-point of a liquid. A little water is made to boil for a few minutes in a flask or retort placed over a lamp until the air has been expelled, and the steam issues freely from the neck. A tightly fitting cork is then inserted, and the lamp at the same moment withdrawn. When the *E.* ceases, it may be renewed at pleasure for a considerable time by the affusion of cold water, which, by condensing the vapor within, occasions a partial vacuum. Liquids in general boil from 60° to 140° lower than their ordinary boiling-points when heated *in vacuo*. The table at top of next page furnishes very exact information respecting the effect of increasing pressure upon the boiling-point of water. — Boiling water contained in a deep vessel is hotter than that in a shallow one, on account of the greater resistance in the one case than the other to the escape of the steam. It is also found that fluids boil at a lower temperature and more quietly in vessels with rough and spicular surfaces than in those with smooth or polished ones. The boiling-point of water, as marked on the scale of the thermometer, is 212° Fahr., but in glass vessels, under common circumstances, it varies from 212.254° to 215.6°; whilst in perfectly pure

and smooth glass vessels water may be heated to 221° Fahr. without boiling. That the elevation of the boiling-point in this case is due to the nature of the surface, may be at once demonstrated by throwing into water, about to boil in a glass matrass, a little iron filings or coarsely powdered glass, when ebullition will commence with almost explosive violence, at the same time that the temperature of the fluid will sink about 2° Fahr.

Boiling-point ° Fahr.	Barometer Inches.	Boiling-point ° Fahr.	Barometer Inches.
184	16.676	200	23.454
185	17.047	201	23.937
186	17.421	202	24.441
187	17.803	203	25.014
188	18.196	204	25.468
189	18.593	205	25.992
190	18.992	206	26.529
191	19.407	207	27.068
192	19.822	208	27.614
193	20.254	209	28.183
194	20.687	210	28.744
195	21.124	211	29.331
196	21.576	212	29.922
197	22.030	213	30.516
198	22.498	214	31.120
199	22.965	215	31.730

Boiling-points of various Liquids at the ordinary Atmospheric Pressure.

Name of Substance.	Boiling-point.
Liquid carbonic acid	— 10.8° Fahr.
Liquid sulphurous acid	+ 17.6 "
Chloric ether	51.9 "
Aldehyde	69.4 "
Ether	94.8 "
Bisulphide of carbon	118.5 "
Bromide	145.4 "
Wood spirit	149.9 "
Alcohol (sp. gr. .815)	173.1 "
Benzole	176.8 "
Dutch liquid	184.7 "
Acetic acid	243.1 "
Sulphur (melted)	609. "
Mercury	662. "

Eccentric, a mechanical contrivance for taking an alternating rectilinear motion from a revolving shaft. It consists of a circular disk or pulley fixed on a shaft or axis which does *not* pass through the centre of the disk. The first diagram in Fig. 152 represents a side-plan of an *E.*; *a a* the disk, the centre of which is at *b*; the inner circle is the shaft with its centre at *c*; *e e* is a section along the axis of the shaft *d*, and *a′ a′* an edge-view. A hoop, *g f*, embraces the groove *a′ a′*, allowing the disk to turn within it. As the *E.* revolves with the axis, the hoop is alternately raised and lowered, and with it the rod *l*, which is keyed into it at *h*. The extent of the rise and fall of the rod is equal to twice *c b*, the distance between the centres. The *E.* is of great use when a reciprocating motion is required to be given to a rod.

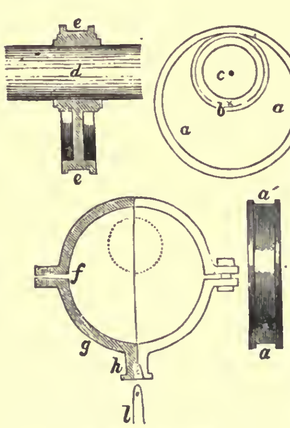


Fig. 152.—Eccentric.

Echantillon [Fr.], a sample, pattern, or specimen.

Echéance [Fr.], a specified day for payment; the falling due of a bill of exchange, etc.

Echeveau, the French name for a skein, knot, or hank of thread or silk.

Echevette, a small hank; the $\frac{1}{10}$ part of a large skein of cotton thread or yarn, and the $\frac{1}{24}$ part of an ordinary skein of wool.

Economy, prudence and care in the management or distribution of materials, etc.

Ecrevisse [Fr.], a cray-fish.

Ecuador (Republica del), an independent state of S. America, traversed by the equator, from which it takes its name. It extends from lat. 1° 35′ N. to 5° 50′ S., and is about 800 m. long, being bounded N. by Colombia, E. by Brazil, S. by Peru, from which it is separated by the river Amazon, and W. by the Pacific Ocean. The following table gives the estimated area and population of each of the 10 prov. into which *E.* is divided, according to official returns of the year 1875:—

Provinces.	Area: English sq. m.	Population.
Chimborazo	5,544	110.860
Los Rios	11,310	61.922
Esmeraldas	7,439	8,000
Guayas	11,502	87,427
Imbabura	11,623	77,379
Leon and Azuay	7,378	225,243
Loja	10,320	60,784
Manavi	5,761	59,098
Oriente	168,460	73,143
Pichincha	9,035	102,281
Indians, unsettled	......	200,000
Total	248,372	1,066,137

Not included in the above statement are the Galapagos, or Tortoise Islands, with an area of 2,950 sq. m., but nearly deserted, which belong to *E.* The capital of *E.*, Quito, stands on the eastern slope of the W. branch of the Andes, 9,534 feet above sea-level, in lat. 0° 13′ 27″ S., lon. 78° 50′ W., 150 m. from Guayaquil; estimated pop. 80,000. The other important cities are Guayaquil (see below), Tacunga (pop. 20,000), Cuença (pop. 25,000), Riobamba (pop. 16,000), Ibarra (pop. 15,000), Ambato (pop. 10,000), Otavalo (pop. 8,000), Guaranda (pop. 8,000), Cotocachi (pop. 4,000). The settled population is composed of Spanish creoles of pure descent, meztisos, mulattoes, and negroes, the greater part of them being agriculturists, graziers, and growers of cocoa. These form about a half of the population. The other half are native Indians, of whom those that live among the mountains (Fig. 153) are mostly agriculturalists, cultivating their lands with much care, and making for themselves coarse stuffs of wool and cotton. The Indians who inhabit the eastern plains are in a much lower degree of civilization. They cultivate only small patches of ground, and apply themselves chiefly to hunting and fishing. Three fourths of the population dwell in the western or mountainous part of the State. With the exception of such rude forms of belief as still linger among the semi-civilized Indians, the only religion professed by the Ecuadorial population is the Roman Catholic; and nowhere in modern times have Jesuits and priests had it more their own way. The oath of a Protestant has no value in a court of justice. The main basis of the constitution of

E. dates from 1843, but several important modifications have been introduced at various periods. The executive is vested in a president, elected for the term of 4 years, while the legislative power is given to a congress of two houses, the first consisting of 18 senators, and the second of 30 deputies, both elected by universal suffrage. The congress has to assemble on the 15th September of every year at Quito, the capital and seat of the government, without being summoned by the government. The nomination of the president takes place, in an indirect manner, by 900 electors, returned by the people for the purpose. The electors appoint, together with the head of the executive, a vice-president, who, in certain cases, may be called upon by congress to succeed him before

Fig. 153. — Civilized Indian of Ecuador.

his term of office has come to an end. The vice-president also fills the functions of minister of the interior. The president exercises his functions through a cabinet of three ministers, who, together with himself and the vice-president, are responsible, individually and collectively, to the congress. There is no power of veto with the president, nor can he dissolve, shorten, or prorogue the sittings of congress. By the terms of the constitution, no citizen can enjoy titular or other distinctions, nor are hereditary rights or privileges of rank and race allowed to exist within the territory of the republic. The president, Don José de Veintemilla, elected president Sept. 8, 1876, was appointed dictator for an unlimited period, by a convention, July 10, 1878.

The surface of *E.* is mostly mountainous, except the plains called *Llanos* in the eastern part. The country is traversed by two Cordilleras of the Andes, many peaks of which, called *nevados*, rise above the limit of perpetual snow. About 16 active volcanoes occur in this republic, one of which, Cotopaxi, is 18,875 feet high, and is remarkable for its symmetrical form, resembling a truncated cone. The highest peak in *E.* is Chimborazo, which rises 21,424 feet above the level of the sea, and belongs to the western range. The culminating points of the Eastern Cordillera are Cayambe, 19,535 feet, and Antisana, 19,137 feet high. The chief rivers are the Amazon (here called the Marañon) and its tributaries, the Napo, Tigre, Pastaza, and Putumayo or Iça. The last of these forms the N. E. boundary of the republic. They flow in a S. E. direction, except the Marañon, which flows nearly eastward. They are navigable for steamboats in the lower part of their course. The Putumayo and Napo are said to be navigable for 500 m. or more. — *Climate.* *E.* presents a great variety of climate in its lofty mountains, elevated valleys, and low tracts called *tierras calientes.* The snow-line varies considerably in the different seasons of the year, as well as according to the form and situation of the individual mountain. Wagner found it in May on Cotocachi, 15,788 feet high; on Guagua-Pichincha in June, 15,741; on Mozo-Pichincha in May, 15,702, on Illiniza in Dec., 15,494; on Carahuirazo in Jan., 15,858; on Tunguragua in Feb., 15,613; and on El-Altar in Feb., 15,854. The greatest difference, according to his observations, existed between the south side of Cotopaxi (15,279 feet) and the north side of Chimborazo (15,914). This elevation of the snow-line — so great when compared with its European position — of course renders possible the existence of vegetable and animal life at a correspondingly great height. While St. Bernard's, the highest point of permanent human habitation in Europe, is only 8,377 feet above the sea, most of the towns and villages of the central plateaux from Ibarra to Cuença lie between 8,500 and 9,500 feet. Many of the huts of the cattlemen are at a height of from 11,500 to 12,800; and the loftiest of these, at Cunayaco, on the north side of Chimborazo, in 1° 28′ S. lat., stands no less than 13,396 feet above the sea. The temperature of these upland districts is of course comparatively low. "At Quito," says Professor Orton, "it is never either spring, summer, or autumn, but each day is a combination of all three." The thermometric mean is 58° 8′; the range in the 24 hours about 10°, the annual maximum 70°, and the annual minimum 45°. In the lower coast-region the tropical position of the country is the main factor, and accordingly at Guayaquil we find the thermometric mean is 83°, and during the rainy season the oppressive and pestiferous air "reminds the geologist of the steaming atmosphere of the Carboniferous period." The rainy season, or *Invierno*, in *E.* continues from December to May, with a short period of dry weather called the *veranillo* shortly after the Dec. solstice. The rest of the year forms the *verano*, or summer, which, however, is in like manner interrupted by a little rainy season called the *inviernillo*, or Cordonazo de San Francisco, after the September equinox. The mean annual rainfall at Quito is 70 inches. In the coast region the two seasons are not very distinctly marked; in the invierno the sky is sometimes perfectly cloudless, while during the verano there occasionally falls a continuous drizzle called *garua.* According to Villavicencio, a gradual diminution of rain has been observed in this district of irregular seasons, and he predicts the assimilation of its climate to that of the rainless coasts of Peru. On the eastern side of the Andes, on the other hand, rain occurs almost at any time of the year, and almost every morning the woods are watered with the gentle showers of the *rocio.* During the verano the Cordilleras and *mesas* are visited by violent hail-storms, and winds of almost incredible force sweep across the wintry scene. In its relation to human health the climate of the upland region is interesting. Goitre is common; and it is found necessary to maintain three large hospitals for lepers. Tubercular disease of the lungs, on the contrary, is said to be completely unknown 8,000 feet above the sea, while it is one of the most frequent of diseases in the coast districts of Tropical America. — *Vegetable Productions.* In the low countries that flank the base of the Andes the banana, cycas, plantain, cacao, jatropha, which produces cassava and manioc, the cotton-tree, indigo, coffee, and the sugar-cane abound; beneath the elevation of 4,000 feet, the plants chiefly cultivated for food are the sweet potato, mandioc, yam, and banana, with rice, maize, and some legumes; but above 3,100 feet most of these become rare, and thrive only in particular situations. The sugar-cane, however, has been grown as far up as 7,500 feet. In some of the valleys are extensive plantations of sugar-cane, cotton, tobacco, and cocoa. The valley of Guayaquil is particularly fertile; the soil is alluvial, and there are few spots even between the tropics which can vie with it in richness and variety of vegetation. It is covered with groves of every kind of tropical fruit, either wild or cultivated, as the pineapple, pomegranate, shaddock, orange, lime,

lemon, peach, apricot, cherimoyer, pulta, grandilla, tuna, and pacay. In the same region are found the olive, pepper-plant, tomatas, and sweet potatoes, gum copal, copaiba balsam, carana, dragon's blood, sarsaparilla, and vanilla. To these succeed, in the humid and shaded clefts on the slopes of the mountains, tree-ferns and cinchona, or Peruvian bark, the finest kind of which is obtained about 8 to 12 miles south of Loja among the mountains of Uritusinga, Villanaco, and Rumusitana, where the trees that yield it grow in a soil resting on mica-slate and gneiss, at the moderate elevation of 5,756 to 7,673 feet above the level of the sea. Between the elevations of 6,000 and 9,000 feet is the region best suited for the European cereals. Within the cereal limits are found the oak, elm, ash, and beech. Higher up, the large forest-trees, except the pine, begin to disappear; and on the mountains of Quito the ekallonia mark the highest limit of trees at an elevation of 11,600 feet. The bejarias, the highest of shrubs, terminate at 13,400 feet, above which, in rich and beauteous verdure, rises the zone of the grasses. Above these, among the trachyte rocks, only lichens, lecideas, and the brightly colored, dust-like lepraria are met with; and to these succeed the regions of perpetual snow. — *Animals.* In some parts of the low country the air swarms with mosquitoes and other flies still more tormenting, while the ground teems with snakes, centipedes, and other reptiles. The banks of the great rivers are crowded with caimans, or aligators. Bats are exceedingly numerous, and of great size; the forests of the warmer regions abound with armadilloes, monkeys, and cavies; and everywhere are found the jaguar, the puma, the ounce, the ocelot, and several varieties of the wild-cat. The pecari and deer are likewise common, as well as that singular animal the ant-eater. The characteristic animals of the Andes are the llama, the guanaco, the vicuña, and the paco or alpaca, some of which are trained as beasts of burden, while others, particularly the vicuñas, run wild among the mountains, where they are hunted by the Indians. Sheep and cattle are reared in great numbers, especially the former, in the valleys of the Andes, and on the declivities of the mountains. Horses, asses, and mules are reared in sufficient numbers to be articles of export. The chief of the birds is the condor, which is found all along the Andes southward as far as the Strait of Magellan, but nowhere to the north of the equator. The turkey, vulture, and gallinago are frequently met with, together with many kinds of smaller birds. In some districts, particularly along the coasts, considerable quantities of beeswax are collected; and higher up there are spots in which the cochineal insect is reared. Along the rivers of the great plain turtles are numerous; and their fat, called *manteca* butter, forms a considerable article of trade. Fishing is carried on to some extent along the coasts, and a good deal of salt-fish is prepared. A murex is also found, which yields a juice used in dyeing purple. — *Minerals.* *E.* is less rich in minerals, especially in the precious metals, than any other of the S. American states. There are, indeed, several mines of gold and silver, but the yearly produce is inconsiderable. In some places are found lead and quicksilver, but the latter is found, as usual, in combination with sulphur, in the form of cinnabar. Near Azogue, 15 m. N. E. by E. of Cuença, the ore is found in an immensely thick bed of quartzose sandstone, containing fossil wood and asphalt. Sulphur is prepared in considerable quantities; gold has been washed from the sands of some of the rivers; and salt is obtained from sea-water along the coast.

Commerce. The foreign commerce of E. is chiefly carried on at the port of Guayaquil, which, with the ports of Manta and San Lorenzo, is open for general importation and the exportation of national produce. The ports open for exportation only are Santa Elena, Callao, Bahia de Caraccas, Loja, and Ibarra. Guayaquil is the only port of general deposit for re-exportation to foreign ports. The principal articles of export of this republic are cocoa, hides, cattle, tobacco, wool, straw hats, coffee, orchilla bark, india-rubber, and an inferior description of cotton. Cocoa is the leading staple, the quantity annually exported reaching over 15,000,000 pounds. The total value of the foreign trade of *E* may be stated at $4,000,-000. The countries which participate in this trade are the U. States, Mexico, Guatemala, Chili, and Peru, in America; and England, Spain, France, and Hamburg, in Europe. The foreign commerce, however, is mainly with Great Britain, the total value of exports to that country in 1877 being $728,955. and of the imports of British produce $1,259,375. The chief exports to Great Britain consist of cocoa, Peruvian bark, and dyestuffs; of the imports of British produce, cotton goods, to the value of $941,575. — The commerce between the U. States and *E.* is very limited, owing mainly to the want of direct communication, and to the fact that the two great staples of the latter country, cocoa and straw hats, find but little demand in this country, the former being of limited consumption, and the latter subject to a duty of 40 per cent. — *Communication.* Artificial means of communication are still for the most part in a very primitive condition, though few countries have so little reason to be content with their natural highways by land or water. Many of the roads, even between important centres of population, are mere mule-tracks, altogether impassable in bad weather, it may be for weeks or months at a time; while the violent torrents which have so frequently to be crossed often present nothing better than more or less elaborate bridges of rope, similar to the *jhuler* or *zampur* of the Kashmirians. The simplest of these is the *taravita*, consisting of a single tight rope, with or without a travelling rope by which the passenger or his luggage may be hauled across; the most complex is the *chimba-chaca*, a rude prototype of the regular suspension bridge, constructed of 4 or 5 ropes of agave-root fibre, supporting transverse layers of bamboos. The best are hazardous to all except a practised foot, and they go out of repair in a few years. Since the middle of the century something has been done to improve this state of affairs; and a very great deal more has always been about to be done. The first carriage was introduced into Quito in 1859, and the owner had to pay a tax for his invention.

Finances have long been in a rotten condition, and trustworthy information is of difficult attainment. More, perhaps, than any other country of S. America, *E.* has been slow in the development of her resources and national industry. Frequent revolutions have paralyzed its trade, and prevented the regulation of its finances. The public revenue in the year 1877 was reported to have amounted to $1,655,000, and the expenditure to $2,400,000. About one half of the revenue is derived from customs duties on imports at the port of Guayaquil. In 1879 the liabilities of the republic amounted to $16,370,000, made up of a foreign debt of $9,120,000, contracted in England in 1855, and internal liabilities amounting to $7,250,000. — A bank of issue and deposit, called the Bank of *E.*, with a capital of a million dollars, was established in 1868.

Money, and *Weights and Measures*, same as those of COLOMBIA. See COLOMBIA.

Guayaquil, the principal port of *E.*, is situate in lat. 2° 11′ 21″ S., lon. 79° 43′ W., on the river of the same name, about 10 m. from the Isla Verde, and 14 m. from the Isla Puña, on the Gulf of Guayaquil, opposite to the mouth of the river. Ships bound to Guayaquil generally call at the Isla Puña, where expert pilots may be had, who carry them up to the town by night or by day, according to the state of the tides. There is a dry dock on the S bank of the river where several ships of a superior construction have been built. The port is one of the best on the Pacific, but the town is unhealthy. Pop. 35,000.

Eddas, a name given in the West Indies to a species of *Colocasia*, the tubers of which are roasted and eaten like the potato; they are also called cocos.

Edge-Tool, a general name for the heavier description of cutting-tools. In trade the following are included under this head: axes, adzes, chisels, gouges, plane-bits, hoes, trowels, hatchets, choppers, mincing and cheese knives, tanners' and curriers' knives, saddlers' knives, ship-scrapers, drawing-knives, etc. Other cutting-tools come under the heads of cutlery, agricultural implements, etc. *E.-T.*, formerly imported from Sheffield, England, are now manufactured in such perfection in the U. States as to command a ready sale in all the European markets. The value of *E.-T.* exported in 1878 was $911,095, of which England contributed $228,850.

Edging, anything used for a border to garments, etc., as narrow laces, fringe, ribbon-edging, etc. — The ornamentation of book edges by color sprinkling, marbling, gilding, and coloring.

Edging-Iron, a semicircular spade for cutting turf.

Edging-Shears, a gardener's shears for trimming the edges of sod around walks or beds.

Edible, anything wholesome or nutritious; esculent, or fit for eating.

Edifice, a large structure, or stately building.

Edinburgh, the capital of Scotland. See GREAT BRITAIN.

Edition, the impression of a work; the publication or republication, as the first, second, or third issue, etc., of any book, newspaper, etc.

Editor, the chief literary superintendent of a newspaper, serial, or periodical; one who revises and prepares a book for publication.

Editorial, appertaining to an editor; the leading article of a newspaper.

Eduction-Pipe, the pipe from the exhaust passage of the cylinder to the condenser.

Edulcoration, the affusion of water on any

substance for the purpose of removing the portion soluble in that fluid. *E.* is usually performed by agitating or triturating the article with water, and removing the latter, after subsidence, by decantation or filtration. It is the method commonly adopted to purify precipitates and other powders which are insoluble in water. The washing-bottle is a most useful instrument for the *E.* of precipitates. In its simplest form, it is a bottle fitted with two bent glass tubes, one drawn to a fine point and reaching to the bottom of the bottle, the other only entering the cork a few inches. By blowing down the latter tube, the water is forced out of the former in a fine stream.

Eel, a peculiar description of fish resembling the snake in its external form, but having otherwise little similarity. There are different species, but the most common is the sharp-nosed eel (*Muræna anguilla*). Eels inhabit almost all our rivers, lakes, and ponds, and are in great esteem for the table. The best kind — the silver eel — is that found in the clearest waters.

Eel River R R. runs from Logansport, Ind., to Butler, Ind , 93.84 m. This Co., whose offices are in Logansport, was organized in 1877 by the purchasing bondholders of the Detroit, Eel River, & Illinois R.R. Co. on the sale under foreclosure of that road. Cap. stock, $2,712,500; net earnings for 1878, $67,842.

Effect, the amount of work performed by a steam-engine or other machine.

Effects, goods or movable property; available funds.

Effervescence, a chemical ebullition or ferment in liquids, which is common in gaseous or aerated waters and wines.

Effervescing Draughts, pleasant gaseous drinks or sweetened beverages.

Effervescing Powders are of various kinds, usually put up in two papers, one containing an alkaline bicarbonate, and the other citric or tartaric acid. After dissolving and mixing the solutions, carbonic acid escapes with effervescence. These powders are useful refrigerants, and are gently laxative. Rochelle salts are often added to increase the laxative effect, constituting what are called Seidlitz powders.

Effigy, a portrait or likeness; the representation of the sovereign on coins.

Effilé [Fr.], a kind of trimming; fringed linen.

Efflorescence, the spontaneous conversion of a crystalline solid into a dry pulverulent form. Crystals which in a dry atmosphere lose their water of crystallization, and become crusted over with a mealy powder, are said to be *efflorescent*.

Egg, the ovum of domestic poultry, which is largely used as food by all nations, and forms a considerable article of commerce in most countries. Besides our home produce, considerable quantities of eggs are annually imported from the Dominion of Canada, in barrels containing from 69 to 75 dozen, and from 2 to 2¼ bushels of oats in which they are packed. For the year 1878 the imports amounted to 672,043,788 eggs, valued at $720,037, all coming from Canada, with the exception of 1,053,000 received from China, and 20,340 from Hong-kong. *Imp.* free.

Choice. The larger end of a new-laid egg feels cold when placed against the tongue. New laid eggs appear semi-transparent when placed between the eye and a strong light, and have a small and perceptible division of the skin from the shell, which is filled with air. This mode of examination among the trade is called "candling." When they shake they are stale. The eggs of turkeys and pea-hens are much esteemed for some purposes; those of ducks and geese are coarse and inferior. — Sound eggs will sink if put into a solution, consisting of 1 oz. of salt in 10 oz. of water; in the same solution indifferent ones will float, whilst bad or worthless ones will swim even in pure water.

Preservation. Eggs may be preserved for any length of time by excluding them from the air. One of the cleanest and easiest methods of doing this is to pack them, with the small end downwards, in clean dry salt, in barrels or tubs, and to place them in a cool and dry situation. We have eaten eggs thus preserved that were more than a twelvemonth old, and that had been for some months on shipboard in a tropical climate, and which yet retained all the peculiar sweetness of new-laid eggs. With a like intention, eggs are placed in vessels containing milk of lime or strong brine, or are rubbed over with butter, lard, or gum water, all of which act by excluding the air. Eggs for keeping should never be laid on their sides, and when kept in the air should be occasionally turned to prevent the yolk attaching itself to the side instead of floating in the albumen. Some persons place the eggs in a netting or on a sieve or colander, and immerse them for an instant in a caldron of boiling water before packing them away. The practice of packing eggs in damp straw, or anything else that can convey a flavor, should be carefully avoided. The shells of eggs are porous, and readily admit the passage of gaseous substances, especially of fetid odors. It is from inattention to this point that a large number of the eggs imported from the coast of France have a less delicate flavor than those of our poultry-yards. Damp chopped straw, as well as most other organic substances exposed to warmth and moisture, readily ferment or putrefy; and during fermentation a considerable increase of temperature takes place, as any one may readily perceive by examining the common hotbeds in our gardens, which are merely masses of organic matter in a state of decomposition. Eggs, as long as they retain the embryo of the future chick in a vital state, possess in themselves a certain degree of warmth, which tends materially to promote the decomposition of the substances they are packed in, particularly in the presence of moisture.

Packing eggs for shipboard. In the bottom of the box may be placed bran, cut hay, and sawdust. Tear up old newspapers to about 8 or 10 inches square. The paper should be about medium, — that is, not too stiff nor too soft. Place one of these pieces of paper on the hand, and on this an egg, on one end; close the lower hand so as to bring the paper up all round the egg, with the other hand crumple the loose corners and edges of the paper down over the other end of the egg; lay another piece of paper on the hand, on which place the same egg, but the other end up; bring up the new paper and crumple down as before. This gives a good cushion to both ends, and a fair one over the centre. Repeat this till you have six thicknesses of paper, reversing the egg each time, and always keeping it on the end. This gives you a ball about 3 to 3½ in. thick by 3½ to 4 in. long. Care should be taken not to press the paper too closely to the egg while covering. Place on one end in the box or basket; place alongside, and press them together close enough to prevent their becoming loose in the box, fillings at the ends and on top with crumpled paper.

Egg-Basket, a kind of wire-basket for standing eggs in to boil, and also to hold them when placed on the table.

Egg-Beater, a whip of wires or a set of wire loops rotated by gear while plunged in the eggs contained in a bowl.

Egg-Cup, a small cup of earthenware, glass, metal, etc., for holding an egg.

Egg-Glass, a small sand-glass, running about three minutes, for boiling eggs by.

Egg-Ladle, a kind of spoon for taking eggs from a saucepan.

Egg-Plant [Fr. *aubergine*], the *Solanum melongena*, an annual herbaceous plant of the same genus as the potato and nightshade, is a native of India and N. Africa. The fruit is a globose or egg-shaped berry about four inches in diameter, but the size varies much according to the quality of the soil and climate. It is cultivated for food in the U. States and various warm climates. It flourishes in New Jersey, but not so well in the more northern States of the Union. It is mostly used fried, after being cut in slices.

Egg-Poacher, a metal vessel with stands, to place eggs in a boiler for cooking.

Egret, Egrette, a tuft of feathers; the feathers of the little egret heron (*Herodias garzetta*) are much esteemed for ornament.

Egypt, a country at the N. E. extremity of Africa, bounded N. by the Mediterranean Sea, S. by Nubia, E. by Palestine, Arabia, and the Red Sea, and W. by the Great Desert. The territories under the rule of the sovereign of *E.*, including those on the Upper Nile and Central Africa, conquered in 1874–75, are vaguely estimated to embrace an area of 1,406,250 sq. m., and to be inhabited by a population of 16,952,000, of whom about one third are in *E.* proper. The following tabular statement gives an area and pop. of the various divisions of the kingdom, and its recent annexations, according to government estimates of the year 1875: —

Division.	Area: sq. m.	Population.
Egypt proper	175,130	5,252,000
Nubia	431,210	1,000,000
Former Kinglom of Ethiopia	588,530	5,000,000
Darfur, and other annexed territories	211,380	5,700,000
Total	1,406,250	16,952,000

E. proper is divided from old into three great districts, namely, *Masr-el-Bahri*, or Lower *E.*; *El-Wustani*, or Middle *E.*; and *El-Said*, or Upper *E.*, — designations drawn from the course of the Nile, on which depends the existence of the country. These 3 geographical districts, subdivided into 15 administrative provinces, had, according to an enumeration made by the government in March, 1875, a rural pop. of 4,603,660, and an urban pop. of 648,340, dispersed over the 6 following towns: Cairo (the capital), pop. 349,883; Alexandria, 212,054; Damietta, 29,383; Tanta, 28,500; Rosetta, 15,002; and Suez, 13,498. At the census of 1872 there were in *E.* proper 79,696 foreigners. The foreign pop. consisted of 34,000 Greeks, 17,000 Frenchmen, 13,906 Italians, 6,300 Austrians, 6,000 Englishmen, 1,100 Germans, and 1,390 natives of other countries. The present sovereign of *E.* is the sixth ruler of the dynasty of Mehemet Ali, appointed governor of *E.* in 1806, who made himself, in 1811, absolute master of the country by force of arms. His position was recognized by Imperial Hatti-Shériff of Feb. 13, 1841, issued under the guarantee of the five great European Powers which established the hereditary succession to the throne of *E.*, under the same rules and regulations as those of the throne of Turkey. The title given to Mehemet Ali and his immediate successors was the Turkish one of *Vali*, or Viceroy; but this was changed by an Imperial firman of May 21, 1866, into the Persian-Arabic of *Khidiv-el-Misr*, or King of *E.*, and the ruler of *E.* has since been known as the Khidiv, or, as more commonly called, Khedive. By the same firman of May 21, 1866, obtained on the condition of the sovereign of *E.* raising his annual tribute to the Sultan's civil list from $1,880,000 to $3,600,000, the succession to the throne of *E.* was made direct from father to son, instead of descending, after the Turkish law, to the eldest heir. By a last firman,

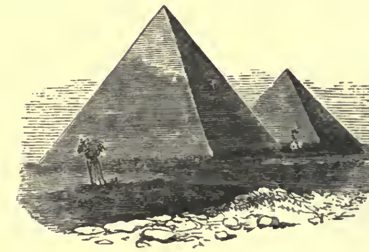


Fig. 154. — The Pyramids.

issued June 8, 1873, the Sultan granted to the Khedive the hitherto withheld rights of concluding treaties with foreign powers, and of maintaining armies, since which date the khedives have held the rank of absolute sovereigns. The administration of *E.* is carried on nominally by a counsel of state of four military and four civil dignitaries, but is actually entirely in the hands of the khedive, whose power is absolute, and subject to no limitation. Ismaïl I. consented, however, under pressure of financial difficulties, to appoint in Sept., 1878, a ministry after European models, and to deprive himself of a portion of his autocratic power; but soon, impatient of the restraint imposed on him, he dismissed his foreign ministers, and was then constrained by France and England to abdicate in favor of his son, Mohamed Tewfik, June, 1879.

The political advantages of *E.*, in situation, natural strength, and resources, can hardly be overrated. It lies in the very route of the trader between Europe and Asia, and that between Africa and the other two continents. It is the gate of Africa, and the fort which commands the way from Europe to the East Indies. The natural ports on the Red Sea and the Mediterranean, selected and improved by the wisdom of Alexander and the Ptolemies, whose enterprises have been eclipsed by those of M. de Lesseps in our own days, have always been enough for its commerce, which the great inland water-way of the Nile has greatly aided. The inhabited country, guarded by deserts and intersected in Lower *E.* by branches of the Nile and canals, in Upper *E.* closely hemmed in by the mountains on either side, is difficult to reach and to traverse; at the same time its extreme fertility makes it independent of supplies from other lands, and thus easier to defend. The ancient wealth and power of *E.* should occasion us no wonder, nor even that the country still prospers in spite of centuries of Turkish misrule. The general appearance of *E.* is remarkably uniform. The Delta is a level plain richly cultivated, and varied alone by the lofty dark-brown mounds of ancient cities, and the villages in groves of palm-trees, standing in mounds often if not always ancient. We sometimes see groves of palm-trees besides those around the villages, but other trees are, except in some parts, rare. In Upper *E.* the valley is in as rich a state of cultivation, but very narrow, and bounded by mountains of no great height, which hem it in. They form the edge of the desert on either side of the valley, which has been cut through a rocky table-land by the river. They rarely take the form of peaks. Sometimes they approach the river in bold promontories, and at others are divided by valleys with the beds of torrents which flow only at very long intervals. The bright green of the fields, the reddish brown or dull green of the great river, and the tender tints of the bare yellow rocks, beneath the deep blue sky, always form a beautiful view. In form the landscape varies little and is not remarkable; in color its qualities are always splendid, and under the general uniformity show continual variety. — *Climate.* The climate of *E.*, being remarkably equable, is healthy to those who can bear great heat, and who avoid the unwholesome tracts of the country, such as the northern coast, where there are extensive salt marshes. Upper *E.* is healthier than Lower *E.* The least healthy time of the year is the latter part of autumn,

when the inundated soil is drying. In the desert, at a very short distance from the cultivable land, the climate is uniformly dry and unvaryingly healthy. *E.*, however, is unsuitable as a permanent residence to Europeans who do not greatly modify their mode of life, and it is almost impossible to rear European children there; but if they arrive after the age of ten or a little more they do not usually feel its ill effects. As a resort for invalids *E.* cannot be recommended without caution. Persons suffering from asthma and bronchitis are likely to gain benefit from a Nile-voyage, unless the season is unusually cold. The climate of the desert does not in all cases suit them, the small particles of sand which are inhaled increasing the irritation. The desert air is undoubtedly good for consumption, and a wise plan is to encamp near Cairo, or still better to find some kind of house within the limits of the desert; and there are ancient sepulchral grottos at Thebes and other sites which afford excellent quarters for any one who will take the pains to build a court and a few rooms in front of them. A Nile-voyage cannot be so safely recommended. The climate on the river itself is more changeable than elsewhere, and often in winter far colder than is good for delicacy of the lungs. No one should visit *E.* in the winter without heavy as well as light clothing. The atmosphere is remarkably dry and clear, except on the sea-coast; and even the humidity which is the consequence of the spreading of the inundation is scarcely felt but by its rendering the heat more oppressive. Sometimes a white fog, very dense and cold, rises from the river in the morning, but it is of rare occurrence and short duration. The heat is extreme during a great part of the year, but it is chiefly felt when accompanied by the hot winds of spring, and the sultry calm of the season of the inundation. The winter is often comparatively severe in its cold, especially as the domestic architecture is intended to protect rather from heat than cold. The general height of the thermometer in the depth of winter in Lower *E.*, in the afternoon and in the shade, is from 50° to 60°; in the hottest season it is from 90° to 100°, and about 10° higher in the southern parts of Upper *E.* On the coast of the Mediterranean rain is frequent, but in other parts of *E.* very unusual. At Cairo there is generally one heavy storm in the winter, and a shower or two besides, the frequency of rain having increased since the growth of Ibrahim Pasha's plantations between the city and the river. At Thebes a storm occurs but once in about four years, and light rain almost as rarely. The wind most frequently blows from the N. W., N., or N. E., but particularly from the first direction. The proportionate prevalence of these winds to those from all the other quarters, in the year, is about 8 to 3; but to those from the S., S. E., and S. W., about 6 to 1. (Clot-Bey, *Aperçu Général sur l'Égypte*, I. p 30.) The northerly winds are the famous Etesian winds of Herodotus, which enable boats constantly to ascend the Nile against its strong and rapid current, whereas in descending the river they depend on the force of the stream, the main-yard being lowered. These winds also cool the temperature during the summer months. The southerly winds are often very violent, and in the spring and summer, especially in April and May, hot sand-winds sometimes blow from the south, greatly raising the temperature, and causing especial suffering to Europeans The famous Simoom, properly called Samoom, is a much more violent hot sand-wind, which is more usual in the desert than in the cultivated tracts, but in either occurring only at long intervals. It is a kind of hurricane, most painful to experience, and injurious in its effects. — *The Nile.* The chief natural feature of *E.* is the Nile, and the great phenomenon of the country the yearly inundation. After the junction in lat. 15° 34′ N. and lon. 32° 30′ 58″ E. of its two great confluents, called the White River and the Blue River, the Nile takes a direction generally N., but with almost innumerable windings. It receives in lat. 17° 45′ the waters of the Tacazzé; and from this point to its embouchure, a distance of about 1,350 m., it receives no affluent whatever, — a solitary instance in the hydrographic history of the world. In antiquity, the *N.* seems to have discharged its waters into the sea by 7 mouths; but it has now only two outlets, those of Rosetta and Damietta. The former, or most W., has a width of 1,800 ft., with a depth of about 5 ft. in the dry season. The Damietta mouth is only 900 ft. wide; but its depth averages between 7 and 8 ft. when the river is lowest. The greatest breadth of the Delta is about 85 m. from E. to W., the distance of its apex from the sea being rather more than 90 m. The water of the Nile differs considerably in appearance and purity at various seasons of the year. A little after midsummer it becomes very turbid, and not long afterwards it assumes a green color for more than a fortnight, owing to the quantity of vegetable matter which it brings down from its upper course. It then resumes its turbid character for the period of the rise, and retains it, though in a less degree, for the remaining portion of the year, until the following midsummer. The water is extremely sweet, particularly in its turbid state. A careful filtration destroys its peculiar flavor, and the best method is to allow it to settle in the porous jars manufactured in the country. It is very wholesome, except during the short period at which it is green. The turbid appearance, greatest during the rise and inundation, is owing to the presence of large quantities of earthy matter, which are annually deposited. The Nile shows the first signs of rising in *E.* about the time of the summer solstice. At Khartoom, where the White Nile and the Blue Nile join, the beginning of the increase is observed early in April. The slowness of the rise in the earlier stage causes this difference. Usually the regular increase does not begin in *E.* until some days after the summer solstice, and the inundation begins about two months after that solstice. The river attains its greatest height at, or not long after, the autumnal equinox, and then, falling more slowly than it had risen, sinks to its lowest point at the end of nine months, when it remains stationary for a few days, until it begins again to increase. The inundation continues rather longer than it naturally would do, because the waters are retained for some time upon the lands by closing the mouths of the canals. The river's banks being a little higher than the rest of the cultivable soil, the water is conveyed by canals or cuttings, and does not pour over the banks. The inundations vary considerably, and, by either failing or rising to too great a height, cause much damage and distress. The Nile rises about 40 feet at the First Cataract, about 36 at Thebes, about 25 at Cairo, and about 4 at the Rosetta and Damietta mouths during a good inundation. If the river do

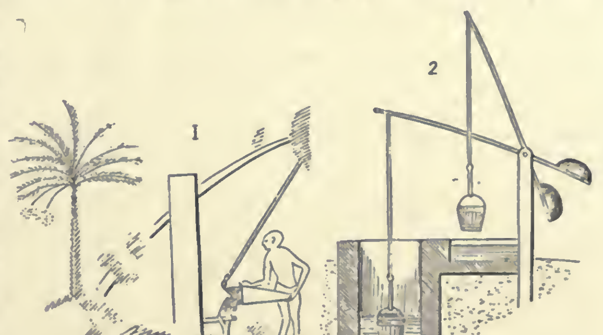


Fig. 155. — Shadoofs.

(1. *Ancient, from Thebes.* 2. *Modern.*)

not attain a greater height than 18 or 20 feet, the rise is scanty; if only 2 or 4 feet more, insufficient; if it attain to 24 feet, or a greater height not exceeding 27 feet, the inundation is good; but a higher rise must be characterized as a destructive flood. Sometimes the inundation has failed altogether; as for seven years (A.D 457-464) in the reign of the Fátimee caliph El-Mustansir bi-lláh, when there was a seven-years' famine; and low inundations always cause dearths. Excessive inundations, on the other hand, produce, or at least foster, the plague and murrain; so that a variation of a few feet is productive of the most serious consequences. Although the water is abundantly charged with alluvium throughout the year, and especially during the inundation, the annual deposit by the river, except under extraordinary circumstances, is very much smaller than might be supposed. Various computations have been made as to the exact deposit left in a century on the land, but they have not usually differed above an inch. If, however, we compare the quantity of deposit on certain very ancient structures, of which we know the date, we shall find that the amount has materially differed in various places. Such differences are the natural results of irregularities in the river's course, of the strength or weakness of the current at particular places, of the nature of the country, and many other disturbing causes. The mean ordinary rate of the increase of the soil of Egypt has been calculated by M. Girard, in the *Descr. de l'Égypte*, as "very nearly" 126 millimètres, or 4.960 English inches in a century. — *Agriculture* The agriculture of the modern Egyptians differs little from that of the old inhabitants. In one respect it is the converse: the ancients excelled in the management of dikes and dams, and raised water only by the simplest methods: the moderns, while they have paid less attention to the great canals and the means by which they were regulated, have employed more ingenious methods of artificial irrigation. The deficiency of population has partly caused the decay of many of the canals and dams and dikes, and has at the same time necessitated the economizing of human labor, for which that of cattle has been in a great meas-

are substituted. Of the machines the most common is the shâdoof (Fig. 155) which is employed for raising water, and is still of the same form as that used by the ancient Egyptians; but there are also two kinds of water-wheels. The more usual of these is that called the sákiyeh, which is composed of a horizontal wheel turned by a pair of cows or bulls, or by one, and connected with a vertical wheel which is on the same axis as another around which are earthen pots in which the water is raised and poured into a trough. The táboot is a similar machine, which differs from the sákiyeh principally in having a hollow wheel instead of the wheel with pots, in the jaunts or fellies of which the water is conveyed. Sometimes a katweh is employed, which is a bucket like that of the shâdoof, having four cords by which two men dip it into the river or canal and raise the water. Steam-pumps are now largely used. — The culture of cotton was introduced by Mehemet Ali with a view to promote his manufacturing schemes, and the Turkish grandees have found it a source of temporary profit. During the American war the profit was at its height, but subsequently it declined. The necessity of constructing dams to exclude the Nile water from the cotton-growing fields has rendered the inundations destructive, and the speculation seems on the whole to have injured the welfare of *E.* The agricultural implements of the modern Egyptians are rude in construction, and similar to those anciently employed in the country. One of these, however, was not known to the earlier inhabitants. This is the nórag, a machine "in the form of a chair, which moves upon small iron wheels or thin circular plates, generally eleven, fixed to three thick axle-trees, four to the foremost, the same number to the hindmost, and three to the intermediate axle-tree. This machine is drawn in a circle by a pair of cows or bulls over the corn." It is employed to separate the grain of wheat, barley, etc., and to cut the straw, which is used for fodder. The ancient Egyptians generally cut the wheat near the ear. An Egyptian garden is a miniature *E.* It is intersected by numerous small channels which are filled by one or more water-wheels. By these channels the water is spread over the garden, divided by them into many square compartments, edged with ridges of earth. This system of course makes it very difficult to keep a garden in good order, and no great variety of flowers is cultivated. — Though Mehemet Ali was very desirous to encourage manufactures, he did not endeavor enough to apply modern science to the improvement of agriculture. Ibrahim Pasha, who succeeded him, always maintained that the country should be agricultural rather than manufacturing, and introduced important improvements during his father's government. This system has been steadily pursued by Ismail I. Before the time of Mehemet Ali a kind of feudal system prevailed, and much of the land was held by small proprietors under the protection of the great emeers. By the massacre of the Memlooks, the pasha destroyed feudalism, and by arbitrarily seizing almost all the landed property rendered private tenure of land a most rare condition. He allotted to those whom he thus unjustly dispossessed annual pensions for life, as the only compensation for an act of tyranny to which even the history of *E.* scarcely affords a parallel. Those whose lands were not confiscated yielded them up through fear, and buried their title-deeds, which are yet so concealed. A system of government in which the supreme authority overlooks such acts, and subordinate governors perpetrate them, in defiance of the Muslim code and Arab jurisprudence, demands the most thorough and searching reform. — *Vegetable products. E.* differs from most other countries in having neither woods nor forests. Besides the palm-groves, we rarely see even a grove of trees, except in Lower *E.* The largest common trees are acacias, sycamore fig trees, and mulberry-trees, all of which are frequently planted on each side of the great roads near Cairo; and the most beautiful trees are the date-tree and the banana. The weeping-willow, myrtle, elm, and cypress are found in the gardens and plantations; and the tamarisk is to be seen everywhere.

The most common of the fruits are dates of various kinds, which are sold half-ripe, ripe, dried, and pressed in their fresh moist state in mats or skins. Many different sorts are enumerated as known in *E.* The dependencies, however, and not *E.*, produce the finest of these dates. The hotter and drier climates of the Oases and Lower Nubia best suit the date-palm; and the pressed dates of Seewah, the ancient Oasis of Jupiter Ammon, are among the most esteemed. The grape is a common fruit, but wine is not made from it on account of the prohibition of Mohammed. The Feiyoom is celebrated for its grapes, and chiefly supplies the market of Cairo. The most common grape is white, of which there is a small kind far superior to the ordinary sort. The black grapes are large, but comparatively tasteless. The vines are trailed on trellis-work, and form agreeable avenues in the gardens of Cairo; but little attention is paid to their culture, the common fault of Egyptian agriculture and gardening, due to the generosity of nature and the indolence of the inhabitants. The best-known fruits, besides dates and grapes, are figs, sycamore-figs, and pomegranates, apricots and peaches, oranges and citrons, lemons and limes, bananas, which are believed to be of the fruits of Paradise (being always in season), different kinds of melons (including some of aromatic flavor, and the refreshing watermelon), mulberries, Indian figs or prickly pears, the fruit of the lotus, and olives. Many of these are excellent, especially the figs and melons. The trees and plants which produce most of them are chiefly confined to the gardens. The cactus, bearing the Indian fig, is extremely common, and forms the hedges of gardens and plantations. The vegetables, etc., are very common and of various kinds, so that we cannot wonder that the children of Israel longed for them in the desert. The principal are beans, pease, vetches, lentils (of which a pottage is made, which is the common food of the Nile boatmen), lupines, chick-pease, the loobiyeh (*Dolichos lubia*), fenugreek, mallows, the bamiyeh (*Hibiscus esculentus*), spinach, purslain, melookheeyeh (*Corchorus olitorius*), leeks, onions, garlic, celery, parsley, chicory, cress, radishes, carrots, turnips, colocasia, lettuce, cabbage, fennel, gourds and cucumbers (both of several kinds), the tomato, the egg-fruit or badingán (black and white), caraway, coriander, cumin, aniseseed, and red pepper. — The chief field-produce is wheat (which is more grown than any other kind of corn), barley, several sorts of millet, maize, rice, oats, clover, pease, the sugar-cane, roses, two species of the tobacco-plant, and cotton, now largely cultivated. The sugar-cane is extensively cultivated, and excellent sugar is manufactured from it. There are fields of roses in the Feiyoom, which supply the market with rose-water. The tobacco produced in *E.* is coarse and strong compared with that which is used by the middle and upper classes and imported from Syria and Turkey. That of Syria is considered the best. Of textile plants, the principal are hemp, cotton, and flax; and of plants used for dyeing, bastard saffron, madder, woad, and the indigo plant. The intoxicating hasheesh, which some smoke in a kind of water-pipe formed of a cocoa-nut, two tubes, and a bowl, seldom used for any other narcotic, is not, as has been erroneously supposed, opium, but hemp. The effect is most baneful. The leaves of the hinnè plant are used to impart a bright red color to the palms of the hands, the soles of the feet, and the nails of both hands and feet, of women and children, the hair of old ladies, and the tails of horses. Indigo is very extensively employed to dye the shirts of the natives of the poorer classes, and is, when very dark, the color of mourning; therefore, women at funerals, and generally after a death, smear themselves with it. Oil is extracted from the seeds of the cotton plant, hemp, colewort, the poppy, the castor-oil plant, sesame, and flax. The high coarse grass called halfeh (*Poa cynosuroides*) grows in great quantity in waste places and among ancient ruins. — Many kinds of reeds are found in *E.*, though, if we compare the representations in the ancient tombs with what we see in the present day, it is evident that they were formerly much more common. The famous byblus, or papyrus, from which paper was manufactured, appears to be nearly, if not quite extinct, since Sir Gardner Wilkinson had not seen it (*Modern Egypt and Thebes*, I. 441). M Delile, in his excellent account of the Egyptian flora, merely mentions it by name in his list as the *Cyperus papyrus*, called in Arabic *berdy*, and found at Damietta, but gives no figure of it. The lotus, greatly prized for its flowers by the ancient inhabitants, is still found in *E.*, though it is not common. — *Animals.* The zoölogy of *E.* is not of remarkable interest, although it contains some very curious points. The absence of jungle and of forest, and the little cover thus afforded to beasts of prey, as well as other wild animals, partly cause this; and we observe few birds of beautiful plumage for the same reason. The most characteristic of the beasts is the camel, which is more at home in the dry climate of *E.* than elsewhere out of his native deserts. It has been remarked, however, that the camel, like his master the Arab, degenerates when removed into a city or a cultivated tract, that the former commonly becomes mangy, and the latter experiences a physical and moral degradation. The Egyptian camel is of the one-humped kind, which has been erroneously called the dromedary, whereas the dromedary is merely a swift camel standing in the same relation to the ordinary camel that our saddle-horse does to our cart-horse. Camel's flesh is for the most part eaten only by the peasants and the Arabs of the desert; by the Copts it is considered unlawful food It is very remarkable that no representation of the camel has been found in the sculptures and paintings of the Egyptian monuments among the very numerous figures of the animals of *E.*, both tame and wild, and of those brought from foreign lands as presents. It does not appear to have been introduced into other African countries until after the Christian era; but it was known to the Egyptians, although it is by no means certain that it was one of their domestic beasts. To modern *E.* the camel is very valuable, since the traffic with Syria, Arabia, Western Africa, and Ethiopia is to a great extent carried on by caravans. But the ancient Egyptians appear to have derived their wealth more from tributary presents than from commerce, to have allowed their land commerce to be much in the hands of foreign merchants, like those who brought Joseph into *E.*, and to have left even their sea commerce partly at least to foreigners. The wild animals are tigers, hyenas, camels, antelopes, apes, dromedaries, horses, large asses, crocodiles, hippopotami, the chameleon, and a kind of rat called ichneumon. The birds are ostriches, eagles, hawks, pelicans, water-fowls of all kinds, and the ibis, which resembles a duck, and was deified by the ancient Egyptians, on account of its de-

stroying serpents and noxious insects. Among the reptiles is a serpent called the cerastes, or horned viper, the bite of which is fatal to those who have not the secret of guarding against it.

Public Works and Manufactures. The public works carried out in *E.* during the present reign would fill a long catalogue, without reckoning the SUEZ CANAL (q. v.) Railway communication has been established between Alexandria, Cairo, Ismaïlia, Suez, Damietta, the Feiyoom, and Asyoot, the various lines covering over 1,200 miles. A Soodân railway, from Wâdee Halfeh to Hannek, and from near Dunkalah to Khartoom, involving costly and difficult engineering for a length of more than 1,000 miles, has been begun with the view of shortening the passage to India, and bringing the produce of the rich southern soil into easier connection with Cairo; these works are, however, at present at a standstill. The canal system has been greatly enlarged and improved, but a still better result is anticipated from the barrage of the Nile, a plan projected by M. Mougel and now about to be carried out for the Khedive by Mr. Fowler. In 1871 the work of building a breakwater to defend the new harbor at Alexandria from the seas caused by the constant southwest winds was begun. The outer breakwater extends above two miles across the mouth of the harbor, enclosing an area of 1,400 acres of calm water. The structure rises 7 feet above the highest sea-level, and is of a uniform width of 20 feet. Harbor works have also been constructed at Suez. At a cost of over $900,000, fourteen fine lighthouses have been erected, seven on the Mediterranean and seven on the Red Sea. Telegraph lines (begun by the enterprise of Said) have been set throughout *E.*, covering nearly 6,000 miles, and putting Alexandria into direct communication with Khartoom; and this branch of the public service is managed by English officials. Submarine telegraphs also bring Egypt into communication with Candia and thence with Constantinople and Otranto, and with Malta and thence with England, France, etc. The post-office was bought by the government in 1865, and under the management of an English post official has been greatly improved. In about 70 towns and villages offices have been established, and several mails a day are despatched from the chief places. The manufactures of *E.* have been in a declining state for several centuries. Mehemet Ali tried to promote them by establishing large manufactories of cotton, silk, and woollen goods, tarbooshes, etc., and, especially in Upper *E.*, sugar-refineries. Ibrahim Pasha was much opposed to his father's policy, and in pursuance of his own views he laid out extensive plantations of olive and other trees, erected powerful steam-engines for the irrigation of his lands, and on all his estates endeavored to encourage agriculture. It cannot be doubted that had he lived the correctness of his conviction that *E.* is an agricultural, not a manufacturing country, would under his rule have been fully verified. Mehemet Ali introduced cotton and largely cultivated it; the Turkish grandees found that from it they could extract more gain than from other field-produce, and large tracts were speedily devoted to its culture. The necessity, however, of excluding the waters of the Nile has caused several destructive inundations; and so long as the cotton growth remained a monopoly of the pasha it was no means of enrichment to the producer. Now, however, that the monopoly is abolished, the trade in cotton is greatly increasing, and this produce will undoubtedly become every year a more important item in the wealth of the country. The old restrictions upon agriculturists have been more or less done away; and the government, whilst not wholly abandoning Mehemet Ali's views on manufactures, is yet alive to the paramount importance of affording every encouragement to agriculture.

Commerce. The commerce of *E.* is very large, but consists to some extent of goods carried in transit, which, however, has greatly declined in recent years, owing to the opening of the Suez Canal. In the year 1878 the total value of imports, consisting chiefly of cotton, linen, and woollen manufactures, hardware, machinery, coal, etc., amounted to $23,060,000; and the exports, which are chiefly cotton, cotton-seed, wheat, barley, corn, beans, and gums, amounted to $80,500,000. To the entire foreign trade Great Britain contributes about 70 per cent, and the rest is divided between France, Austria, Italy, and Russia, in descending proportions. There is almost no direct trade between *E.* and the U. States.

The cotton crop in 1878 extended over about 950,000 feddâns (= 950,000 acres, nearly), and produced 2,877,095 quintals (of 110 lbs.) of ginned staple, 2,150,000 ardebs (of 5 bushels) of seed, and 4,124,300 loads of cotton sticks, all together reaching a total value of about $65,000,000. The export of cotton to Great Britain for the same year amounted to 181,214,116 lbs., valued at $31,279,660.

Finances. The revenue of *E.* is variously estimated at from $40,000,000 to $55,000,000 per annum. Mr. Stephen Cave, sent to *E.* by the British government in 1875 to assist the Khedive in reforming the finances of his country, reported the income for 1875 at $53,445,350. According to Mr. Cave, this revenue was insufficient to meet both the cost of the general administration of the country, estimated at from 25 to 30 million dollars, and the charges of a debt variously reported to amount to from 430 to 455 million dollars. In order to prevent unavoidable insolvency, Mr. Cave recommended a conversion of the debt, to be effected with the assent of the bondholders. The same recommendation was repeated by Mr. George J. Göschen and M. Joubert, representatives of the British and French bondholders of the Egyptian debt, who went to *E.* in the autumn of 1876 to confer with the Khedive on the finances of *E.* From the information furnished to them, they arrived at the conclusion that the annual revenue for 1876 and the following years would amount to $54,610,000, and that a balance might be established with the expenditure, if the public liabilities of *E.* and the private debt of the Khedive were separated, and reduced by conversion. The plans submitted by Messrs. Göschen and Joubert were adopted Nov. 18, 1876, by the Khedive, who decreed that the "Unified Debt of *E.*" should be reduced to $295,000,000 by conversion, and be separated entirely from the "privileged debt" and other loans. The interest on the "unified debt" was fixed at seven per cent, of which one per cent was to be retained as a sinking fund during nine years, to provide for the extinction of revenue from the Moukabala tax, ceasing at the end of this term. The control, both of the debt of *E.* and of the general revenue and expenditure, was placed, by the stipulations agreed to by the Khedive in Nov. 1876, under the control of a financial commission, consisting chiefly of Europeans. A controller-general of revenue and a controller-general of the public debt and audit were appointed, with the fullest powers of supervision. The first report of the actual revenue of Egypt made by the controller-general was issued in April, 1878. It stated the total receipts of the government in the year 1877 to have been $43,751,600, and it estimated the total receipts for the year 1878 — being "a year following a bad Nile" — at no more than $36,500,000. The same report notified that the service of the public debt for the year 1878 would require $29,500,000, leaving only $7,000,000 available to carry on the administration of the country. By the convention with Messrs. Göschen and Joubert, ratified by the Khedive November 18, 1878, there was instituted a Commission of the Public Debt. It is made a permanent institution, and the revenues of *E.* are pledged to the Unified Debt, to be paid direct to the Commission. According to a report of the Public Debt Commissioners, Signor P. Baravelle and Major E. Baring, the liabilities of *E.*, placed under European control, amounted on the 8th of Sept., 1877, to $391,419,100. Not included in this total was the personal debt of the Khedive, called that of the Daira Sanieh, which was returned at $44,077,150, in an official report issued in August, 1878. To provide for the interest of this debt, the Khedive made over, at the same date, his private estates, estimated to embrace 432,000 acres, of the annual value of $2,125,000, to the Commission of the Public Debt. Not secured by any stipulation on the part of the government is the floating debt of *E.*, the exact amount of which is not known, but which is estimated to be over $25,000,000.

Money. The standard unit of currency is the *kirsh*, or piastre (= about 5 cents), which is coined in gold pieces of 5, 10, 20, 25, 50, 100 piastres; silver of 1, 2½, 5, 10, 20 piastres. Copper coins of 5, 10, 20 *paras* (or faddahs, 40 to the piastre) and 1 piastre are also coined. The *kees*, or purse, of 500 piastres, is equal to about £5 2*s.* 6*d.* The *khazneh*, or treasury, consists of 1,000 purses. Besides the regular Egyptian currency, European coins of all kinds are commonly employed in *E.* especially the English sovereign, the French napoleon, the Venetian sequin, the Spanish doubloon and dollar, the 5-franc piece, and the Constantinople coins.

Weights and Measures. The Egyptian measures are, — the *fitr*, or space measured by the extension of the thumb and first finger; the *shibr*, or span; and the *cubit* (of three kinds, = 22⅔, 25, and 26⅔ inches). The measure of land is the *feddan*, very nearly equal to the English acre, subdivided into 24 *keerâts*, and each of these into 330 (formerly 333⅓) *kasabehs*, or rods, the kasabeh being a square measure with side of 22 *kabdehs*, each equalling 6⅛ inches. The *ardeb* is equal to about 5 bushels, and is divided into 6 *weybehs*, and each weybeh into 24 *rubas*.

The weights are these: —

64 *kamhahs* (or grains of wheat), or 48 *habbehs* (or grains of barley) = 1 dirhem (= 48 gr. Troy).
12 *dirhems* = 1 wukeeyeh or ounce (= about 575 gr.).
12 *wukeeyehs* = 1 ratl or pound (= 15 oz. 13 dr. avoir.).
2¾ *ratls* = 1 wukkah or oke (= 2¾ lb.).
36 *wukkahs* = 1 kantâr or cwt. (= 99 lb.).
24 *keerâts* = 1 mithkâl or weight of a deenâr (= 72 gr.).

The French metrical system has been established by Ismail I., but has not yet been generally adopted.

Alexandria, the principal seaport of *E.*, on the coast of the Mediterranean, about 14 m. W.S.W. of the Canopic mouth of the Nile; the lighthouse being in lat. 31° 11′ 43″ N., long. 29° 51′ 40″ E. The light, which is fixed, is visible 20 m. in clear weather. The situation of this famous city was admirably chosen by its far-seeing founder, Alexander the Great. Until the discovery of the route to India by the Cape of Good Hope, *E.* formed the centre of the commerce between the eastern and western worlds; and Alexandria was placed in the most favorable position in *E.* for an emporium, being the only port on its northern coast where there is, at once, deep water and security for shipping throughout the year. The ports of Rosetta and Damietta, the former on the west and the latter

on the eastern arm of the Nile, are both difficult of entrance, each having a bar upon which there is always a dangerous surf. Ships bound for Alexandria avoid this serious inconvenience; and by means of an artificial navigation, stretching from the city to the western branch of the Nile, it has almost the same facilities for internal navigation that are enjoyed by the cities referred to. Under the Turks the city sank into insignificance, numbering only about 6,000 inhabitants. Soon after Mehemet Ali became ruler of *E* he turned his attention to the restoration of Alexandria. One of the most important works that he effected with this view was the opening of the Mahmoudieh Canal in 1820. This was accomplished at a cost of about $1,500,000, and, for want of proper management, at a melancholy loss of human life. It is about 50 m. in length, with an average width of about 100 feet, and communicates with the Rosetta branch of the Nile at the village of Atfeh. Since Alexandria became the centre of the steam communication between Europe and India, and the principal station on the Overland Route, its progress has been rapid. It has now regular communication with England, Marseilles, Brindisi, Constantinople, etc. In 1856 a railroad line between Alexandria and Cairo was opened for traffic, and was shortly afterwards extended to Suez, and several extensions have since been made to the cotton districts of the Delta. The ancient city was situated a little more inland than the modern one, opposite to the small island of Pharos, on which was erected the lighthouse, so celebrated in antiquity. This island was, partly by artificial means and partly by natural causes, gradually joined to the land by a mound, and on this the modern town is principally built. The isthmus and island have now the form of a T, its head being N. E. and S. W. A square castle or tower, built on a small islet or rock, at the extremity of a mole projecting from the N. E. angle of the city, is still called the Pharos, and may, perhaps, occupy the site of the ancient lighthouse. On each side of this islet there is a port. That on the western or African side, called the Old Port, the *Eunostos* of the ancients, is by far the larger and better. It stretches from the town westwards to Marabout about 6 m., and is about 1½ m. in width. It is bounded on the N. partly by the W. tongue or angle of the island on which the city is partially built, at the extremity of which is the new lighthouse, and partly by rocks and sand-banks. It has three entrances. The first, or that nearest the city, having 17 feet water, is about 1¾ m. S. W. from the lighthouse; but it is too narrow and difficult to be attempted by any one not thoroughly acquainted with the port. The *eastern* side of the second or middle entrance is marked by buoys which lie about 2½ m. S. W. from the lighthouse; it is about a quarter of a mile wide, and has, where shallowest, 27 feet water. The third or western entrance has its *western* boundary within about three eighths of a mile from the east end of Marabout Island: it is about half a mile wide, and has from 25 to 27 feet water in its shallowest places. This last is the best entrance. Ships, when in, may anchor close to the town in from 22 to 40 feet water, and there is good anchorage in deep water all along the shore. Foreigners were formerly excluded from this port; but this prohibition no longer exists, and it is now principally resorted to by the shipping frequenting the port. What is called the New (though it be really the oldest) or Asiatic harbor is on the eastern side of the town. A rock called the Diamond lies a little to the east of the Pharos tower; and ships entering the port ought to have this rock about a cable's length on the right. If they get much farther to the left they will come in contact with a shoal which stretches westward from the Pharillon, or little tower, on the east side of the port. The water immediately within the port S. W. from the Pharos is from 30 to 40 feet deep; but the space for anchorage is very limited, and is exposed to the northerly gales. Ordinary tides rise 2 feet; but during the overflow of the Nile the rise is 4 feet. Variation 13° west. — The general appearance of Alexandria is by no means striking; and from its situation its environs are sandy, flat, and sterile. The Frank quarter, on the other hand, presents the appearance of a European town, having handsome streets and squares, and excellent stores. Among the principal public buildings are the palace of the pasha, the naval arsenal, the naval and military hospitals, custom-house, bourse, two theatres, several mosques, churches, convents, etc. Few of the remains of the ancient city are now visible. Most of those that were to be seen a few years ago have since disappeared, and the celebrated Cleopatra's Needle itself is now to be seen in London, on the bank of the gloomy river Thames. The most striking of still standing ancient monuments is the column styled Pompey's Pillar. It stands on a mound of earth about 40 feet high, and has a height of 98 feet 9 inches. The shaft consists of a single piece of red granite, and is 73 feet long and 29 feet 8 inches in circumference. The capital is Corinthian, 9 feet high, and the base is a square of about 15 feet on each side. From an inscription it appears to have been erected in honor of the Emperor Diocletian, and it was formerly surmounted by a statue of that monarch. The climate of Alexandria is mild and salubrious. The heats of summer are modified by the N. W. winds from the sea, which prevail during nine months of the year, the thermometer seldom rising above 85° F. In winter a good deal of rain falls, and throughout the year the atmosphere is generally moist, being saturated with a saline vapor from the sea. Pop. 212,054.

Suez. See SUEZ CANAL.

Eidam, a kind of Dutch cheese of a globular form, and weighing about 3½ lbs. It is imported in cases of one dozen.

Eider-Down. See DOWN.

Eidograph, an instrument for copying drawings.

Eighteenmo, the size of a book formed by folding a medium-size paper, 18 × 24 inches, into 18 leaves or 36 pages, or a double medium paper, 24 × 36 inches, into 36 leaves or 72 pages. The term is usually written 18mo.

Ejoo Fibre, or **Indian Hemp**, a strong horsehair looking fibre, obtained in the Malayan Islands from the sago-palm, *Arenga saccharifera.* It is very durable and tenacious, and universally employed, in the countries where the tree is indigenous, for making cordage, for nets and seines, for the rigging of vessels, and for cables.

Elaine. See OLEINE.

Elastic Bands, belts, braces, gaiters, etc., made with threads of india-rubber, either naked or covered.

Elastic Gums, a common name given to those vegetable extracts, such as india-rubber and gutta-percha, which may be elongated by heat, etc.

Elaterium, a medicinal feculence deposited from the juice of the wild cucumber, *Momordica elaterium.* It is sold in thin cakes, and when pure has a pale gray or greenish color, floats on water, is easily pulverized by pressure, and forms with rectified spirits a rich, green-colored tincture. Larger doses than ¼ gr. of pure *E.* are poisonous.

Elder, the *Sambucus nigra*, a large shrub or small tree, common in all parts of the U. States. The wood, which is remarkable for its hardness, is often used for carpenters' rules, weavers' shuttles, meat-skewers, etc. The light pith of the branches is used for electrical purposes. The recent flowers are regarded as diaphoretic and pectoral, and a distilled water (*E.-flower water: aqua sambuci*) is made of them. The inner bark is purgative and emetic, and is used in dropsy; the leaves are purgative. The juice of the fresh berries is made into wine (*E. wine*), and is largely used to make factitious port wine, and to adulterate the real wine. *E.* wine is extensively manufactured at Newark, N. J.

Elecampane, the aromatic bitter root of *Inula Helenium*, which is much used in some quarters, made into a sirup, for colds and coughs; from its pungency it was formerly in repute as a stomachic; a sweetmeat is also made from it.

Electrical Machine, an instrument for the excitation and collection of electricity. Fig. 156 represents the improved Ramsden machine. Between two wooden supports a circular glass plate, P, is suspended by an axis passing through the centre, and which is turned by means of a glass handle, M. The plate revolves between two sets of *cushions* or rubbers, F, of leather or of silk, one set above the axis and one below, which, by means of screws, can be pressed as tightly against the glass as may be desired. The plate also passes between two brass rods shaped like a horseshoe, and provided with a series of points in the sides opposite the glass: these rods are fixed to larger metallic cylinders, C, which are called the prime *conductors.* The latter are insulated by being supported on glass feet, and are connected with each other by a smaller rod, *r*. The action of the machine is founded on the excitation of electric-

ity by friction, and on the action of induction. By friction with the rubbers, the glass becomes positively, and the rubbers negatively electrified; but the rubbers communicate with the ground by means of a chain, and, consequently, as fast as the negative electricity is generated, its tension is reduced to zero by contact with the ground. The positive electricity of the glass acts then by induction on the conductor, attracting the negative electricity. This negative electricity collects in the points opposite to the glass. Here its tension or tendency to discharge becomes so high that it passes across the intervening space of air, and neutralizes the positive electricity on the glass. The conductors thus lose their negative electricity, and remain charged with positive electricity. Before use, the rubbers are coated either with powdered *Aurum musicum* (sulphuret of tin), or

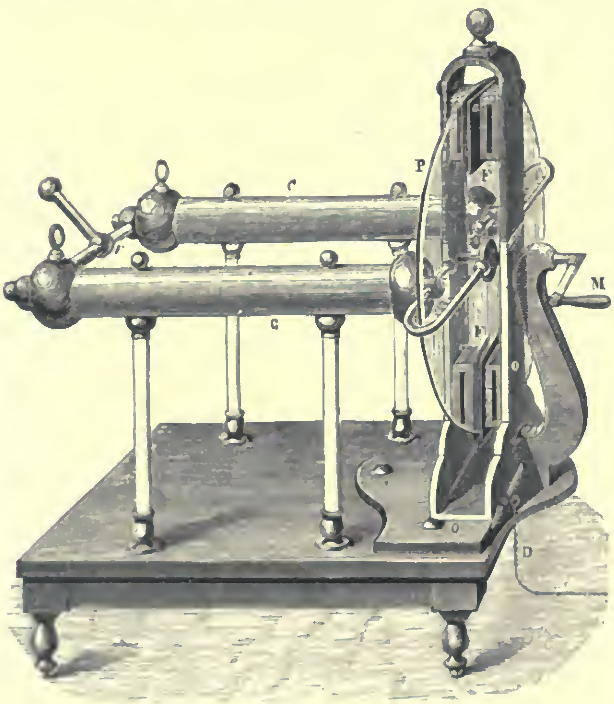


Fig. 158 — Electrical Machine.

graphite, or amalgam. If the hand be brought near the conductor when charged, a spark follows, which is renewed as the machine is turned. In this case the positive electricity decomposes the neutral fluid of the body, attracting its negative electricity, and combining with it when the two have a sufficient tension. Thus, with each spark the conductor reverts to the neutral state, but becomes again electrified as the plate is turned. The *Plate machine*, which is now much used in this country, consists of a thick plate of glass mounted on a horizontal axis and turned by a crank. At each end there is a glass standard, the one surmounted by a brass ball called the *negative* conductor, the other by a long cylinder of brass with rounded ends, called the *prime* or *positive* conductor. From the standard of the negative conductor project two brass strips in the form of a clamp, which hold the rubbers against the glass plate. These rubbers are pieces of wash-leather or woollen cloth covered with the amalgam above described. Connected with the prime conductor are metallic points, nearly in contact with the surface of the glass, which serve to collect its *E.* The lower half of the plate is covered with flaps of oiled silk which confine the *E.* until it is collected by the points of the prime conductor.

Electric, Electrical, exhibiting the effects of electricity when "excited" by friction; pertaining to, derived from, or produced by electricity. An *Electric* is a substance which may under ordinary circumstances be readily made to evince electrical properties by friction. Electrics do not transmit or conduct electricity; whilst, on the other hand, *anelectrics* are good transmitters or conductors of electrical action. The most perfect electrics are shell-lac, sulphur, amber, jet, resinous bodies, gums, gun-cotton, glass, silk, diamond, agate, and tourmaline; dry fur, hair, wood, feathers, and paper; turpentine and various oils; dry atmospheric air and other gases, steam of high elasticity, and ice at 0° F. The most perfect aneletrics or conductors are the metals, charcoal, and saline fluids.

Electric Clock. Electricity began to be used as a regulator of clocks about 1840. In strictness, an *E. C.* has no maintaining power — either weight or spring — of its own; it is a mere skeleton, receiving impulse from another clock. It has a dial-face, hour and minute hands, wheels to give motion to these hands, from the arbor of a seconds-hand, and a small electromagnet. There may be such a clock as this in every room of a large building, and all of them will show exactly the same time as the parent clock which supplies the motive-power. Wheatstone, Kain, Appold, Shepherd, Jones, Smyth, and other inventors have contrived beautiful means for producing and communicating this motion. In the parent clock of Shepherd's *E. C.* the pendulum, the going train, and the striking train have each their own distinct system of electro-magnets; the pendulum may continue to oscillate although the clock train is at rest. In these and in all other forms of *E. C.* each impulse of the parent clock is communicated to all the secondary clocks through a long wire; and thus it is that nearly all the railroad stations in England receive Greenwich time from a parent clock at the Observatory.

Electricity, one of the great forces of nature; also that department of physical science which embraces all that is known respecting this particular force. Many theories respecting the nature of *E* have been advanced for the purpose of explaining electrical phenomena. The theory of Dr. Franklin supposed the existence of a single homogeneous, imponderable fluid, of extreme tenuity and elasticity, in a state of equable distribution throughout the material world. This fluid is assumed to be repulsive of its own particles, but attractive of all other matter. When distributed in bodies, in quantities proportionate to their ca-

pacities or attraction for it, such bodies are said to be in their "natural state." When we increase or diminish the natural quantity of *E.* in any substance, excitation is the result, and the substance, if "overcharged," is said to be electrified "positively"; or, if "undercharged," "negatively." These theories, and all others based upon the assumption that *E.* is a form of matter, have been found to be inadequate for the elucidation of electrical phenomena. At the present day, however, two kinds of electric forces are recognized, and distinguished as *negative* and *positive*, but they are both assumed to be analogous in principle, and very generally assumed to be simply due to different analogous motions of matter. For a full exposition, however, the reader must refer to some of the especial works on the subject.

Electric Light. See LIGHT (ELECTRIC).

Electric Telegraph. See TELEGRAPH.

Electro-Etching. See ETCHING.

Electro-Gilding. See ELECTRO-METALLURGY.

Electrolysis, the chemical decomposition of a substance by means of electricity.

Electro-Magnet, a bar of soft iron which, under the influence of a voltaic current, becomes magnet; but this magnetism is only temporary, for the coercive force of perfectly soft iron is null,

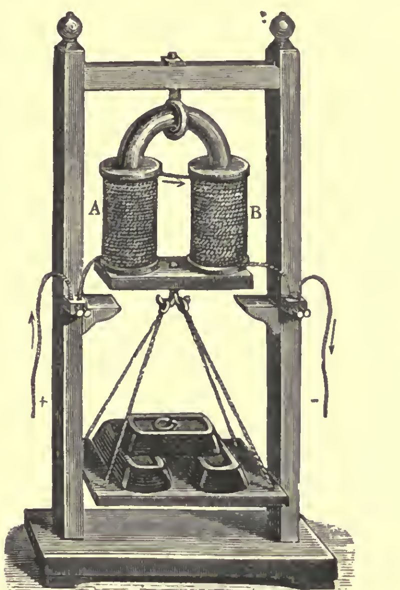


Fig. 157. — ELECTRO-MAGNET.

and the two magnetic fluids neutralize each other as soon as the current ceases to pass through the wire. An *E.-M.* has the horseshoe form (Fig. 157), and a copper wire, covered with silk or cotton, is rolled several times round them on the two branches, so as to form two bobbins, A and B. In order that the two ends of the horseshoe may be of the opposite polarity, the winding on the two limbs, A and B, must be such that if the horseshoe were straightened out, it would be in the same direction. The power of the *E.-M.* is enormously greater than that of any permanent magnet. A permanent magnet, weighing 1 pound, has been made to carry 27; but Dr. Joule was able to construct a small *E.-M.* by arranging the coils to advantage, and proportioning the wire of the core, and the thickness and length of the wire, which would carry 3,500 times its own weight. *E.-M.*, instead of being made in one piece, are frequently constructed of two cylinders, jointly screwed to a stout piece of the same metal. Such is the *E.* in Morse's telegraph.

Electro-Magnetism. That part of the science of electricity and magnetism which treats of the production and properties of temporary magnetism by the passage of a current of electricity round a bar of soft iron. See MAGNETISM, and ELECTRO-MAGNET.

Electro-Metallurgy, Electrotypy, Galvanoplasty, Electro-Gilding, Electro-Plating, etc., a term including all processes in which electricity is applied to the working of metals. This wonderful and beautiful art may undoubtedly be traced to the early experiments of Cruikshank, Brugnatelli, and Davy; but it remained undeveloped until the late Professor Daniell devised in 1836 that particular form of battery which bears his name. A Daniell's cell consists, in its usual form, of a copper vessel containing a saturated solution of blue vitriol or sulphate of copper, in which is placed a porous cylinder containing dilute sulphuric acid; a rod of amalgamated zinc is immersed in the acid, and on the two metals being connected by means of a conductor, electrical action is immediately set up. The zinc, which forms the positive or generating element, is dissolved, with formation of sulphate of zinc; whilst the blue vitriol is reduced, and its copper deposited, in metallic form, upon the surface of the copper-containing vessel, which forms the negative or conducting element of the combination. Any one using this form of battery can hardly fail to observe that the copper which is thus deposited takes the exact shape of the surface on which it is thrown down, and indeed presents a faithful counterpart of even the slightest scratch or indentation. The first application of the art was made in France in 1839, and it became soon a fashionable amusement to copy coins, seals, and medals, by the new process. These copies in metals are termed *electrotypes*. The apparatus employed in the early days of the art, and which may still be conveniently used for small electrotypes, is

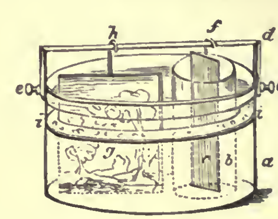


Fig. 158. — ELECTRO-METALLURGY.

a. An oval vessel of salt-glazed earthenware or wood nearly filled with a saturated solution of sulphate of copper.

b. A porous diaphragm, containing the cylinder or plate of zinc (*c*), and filled with dilute sulphuric acid.

d. A small bar of brass or copper fastened to the vessel by the binding screws (*e*, *e*), and supporting the plate of zinc (*c*), by the hook of copper wire (*f*), and the mould (*g*), by the hook (*h*).

i. A small shelf or partition to support crystals of sulphate of copper, to keep up the strength of the solution.

similar in principle to a single Daniell's cell. It usually consists (Fig. 158) of a glazed earthenware jar containing a solution of sulphate of copper, which is kept saturated by having crystals of the salt lodged on a perforated shelf, so that they dip just below the surface of the solution. A

smaller porous cylinder, containing very dilute sulphuric acid, in which a rod of amalgamated zinc is placed, stands in the jar, and is therefore surrounded by the solution of sulphate of copper. The object to be copied is attached by a copper wire to the zinc, and is immersed in the cupric solution. It thus forms the negative element of a galvanic couple, and a current of electricity passes from the zinc through the two liquids and the intervening porous partition to the object, and thence back to the zinc through the wire, thus completing the circuit. During this action, the zinc dissolves, and sulphate of zinc is formed; at the same time the copper solution is decomposed, and its copper deposited upon the metallic surface of the object to be coated, — the solution thus becoming weaker as it loses its copper, but having its strength renewed by consumption of fresh crystals of blue vitriol. To avoid the complete incrustation of the metal or other object, one side of it is coated with varnish or some other protective medium, so that the deposition of copper takes place only on such parts as are exposed. The deposit may be easily removed when sufficiently thick, and will be found to present an exact counterpart of the original, every raised line being represented by a corresponding depression. To obtain a fac-simile of the original it is therefore necessary to treat this matrix in the same way that the original was treated, and this second deposit will of course present the natural relief. Another method consists in taking a mould of the original coin in fusible metal, and then depositing copper upon this die, so as to obtain at once a direct copy of the original. Considerable extension was given to the process by the discov-

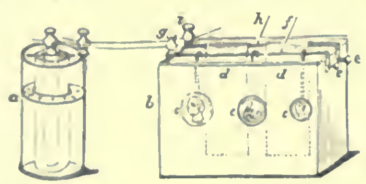


Fig 159. — Electro-Metallurgy.

a. A constant battery cell.

b. Decomposition cell: a cubical vessel made of wood or earthenware, and filled with a mixture of 1 part of dilute sulphuric acid (1 acid + 9 water), and 2 parts of saturated solution of sulphate of copper by measure.

c, c, c. Moulds suspended to the brass rod (*f*), and connected with the zinc or positive element of the battery (*a*), by means of the screw (*g*).

d, d. Pieces of sheet copper suspended on the brass rod (*h*), and connected with the zinc end of the battery, by means of the screw (*i*), employed to keep up the strength of the cupreous solution in the decomposition cell.

ery, apparenly trivial, made in 1840, that an electro-deposit of metal could be formed upon almost any material if its surface was rendered a conductor of electricity by a thin coating of graphite or "black lead." Instead, therefore, of copying a coin in fusible metal, or indeed in any metallic medium, it is simply necessary to take a cast in plaster of Paris, wax, gutta percha, or other convenient material, and then to coat the surface with finely powdered black-lead, applied with a camel-hair pencil. Medals in high relief, with much undercutting, or busts and statuettes, may be copied in electrotype by first taking moulds in a mixture of glue and treacle, which forms an elastic composition capable of stretching sufficiently to permit of removal from the object, but afterwards regaining its original shape. — About the same time another great step in the art was made by introducing the use of a separate battery. Daniell's cell, in consequence of its regular and constant action, is the favorite form of electric generator (Fig 159). The copper cylinder of this arrangement is connected with a plate of copper placed in a trough containing a solution of sulphate of copper, to which a small quantity of free sulphuric acid is commonly added; whilst the zinc rod of the cell is connected with the objects on which the copper is to be deposited, and which are also suspended in the bath of cupric solution. The current enters the bath at the surface of the copper plate, which is the *anode* or positive pole of the combination, and passes through the solution to the suspended medals which constitute the *cathode* or negative pole. As fast as the copper is thrown down upon these objects, and the solution is therefore impoverished, a fresh supply is obtained by solution of the copper plate; this copper is consequently dissolved just as quickly as the electrotypes are produced, and no supply of crystals is needed, as in the case of the Daniell cell. The great advantage of using a separate battery is, that several objects may be coated at the same time, since it is only necessary to attach them to a metal rod in connection with the battery. Almost any form of galvanic arrangement may be employed by the metallurgist as a generator of electricity. But as the exciting liquid in a battery needs to be replenished from time to time, and as the zinc plates also wear out, its use is attended with more or less inconvenience in the workshop, and the electro-metallurgist has therefore turned his attention to other sources of electricity. In the machine constructed by Mr. Wilde, which has been largely employed by electro-metallurgists, a small magneto-electric apparatus, with permanent magnet, is employed to excite the electro-magnet of a much larger machine. The induced current of the second machine is stronger than that of the first in proportion as the electro-magnet is more powerful than the permanent magnet; this second current may then be used to excite another electro-magnet, and hence, by means of this principle of accumulation, currents of great energy may be obtained. The armatures in these machines are constructed on Siemens's principle, and consist of long bars of iron magnetized transversely, and having the wire wound longitudinally. During the rotation of the armature, so much heat is developed that special means are taken to prevent its accumulation. In another form of Wilde's machine, a vertical disk carrying a number of coils, each with its own core, is caused to rotate between two rings of magnets. Powerful machines, with multiple armatures of this kind, have been constructed, which are capable of depositing 4½ cwt. of copper every 24 hours. Thermo-electricity is another source of electromotive power of which the practical worker has availed himself. In 1843 a patent was taken out by Moses Poole for the use of a thermo-electric pile in place of a voltaic battery, but it is only within the last few years that such a source of electricity has been introduced into the workshop. The best-known form of thermopile is that devised by M. Clamond of Paris. One element is formed of tinned sheet iron, and the other of an alloy composed of two parts of zinc to one of antimony. A large number of these pairs, insulated from each other, are arranged in circular piles around a central cavity, in which their junctions are heated by means of a Bunsen burner. The ease with which such an apparatus can be manip-

ulated recommends this source of electricity to the electro-metallurgist.

Having procured a supply of electricity from one or other of these sources, the electro-metallurgist applies it either to the deposition of a metal upon a matrix or to the coating of one metal by another. Hence the art of *E.-M.* divides itself into two branches, one being called *electrotypy*, and the other being generally known as *electro-plating*. In the electrotype (see ELECTROTYPING) the reduced metal is separated from the mould on which it is deposited, and forms a distinct object of art; whilst in electro-plating the deposited metal forms an inseparable part of the plated object.

Electro-plating. The solution generally employed as electrolyte from which silver is separated is that of argento-cyanide of potassium. It should be borne in mind that the cyanide of potassium is a very dangerous poison. As in the deposition of copper, the apparatus used for plating may be the single cell, or the decomposition cell and battery. For plating small objects, a single cell of a Daniell's battery will afford ample decomposing power, but the battery arrangement is much more convenient, effective, and economical. On a large scale, electro-plating is carried out in oblong vats, occasionally holding from 200 to 250 gallons of solution. Silver plates connected with a powerful voltaic or magneto-electric battery are placed at intervals in the vats; they form the positive electrodes, and correspond in extent of surface with the articles to be coated, and face them on both sides. The articles (teapots, cruet-frames, forks, spoons, etc.) act as the negative electrodes, and are suspended by copper wires from brass rods laid lengthways over the vats, and connected with the battery. The articles plated are usually formed of nickel silver or German-silver, which is chosen on account of its silvery whiteness, a quality of great importance when portions of the coating of noble metal have been worn away by use. — To prepare the articles for plating, they are first boiled in a solution of potassa, to free them from grease; they are then quickly dipped in red nitrous acid, to remove any oxide that may have formed on the surface, and after this well washed in water, to remove every trace of acid. They are then suspended from copper wires, and dipped into a solution of mercury in cyanide of potassium, or some other mercurial solution, and afterwards washed in water, as before. The amalgamation of the surface effected by the last operation promotes the adhesion of the film of silver. The articles, having been weighed, are now immersed in the silvering solution, and left until a sufficient amount of silver has been deposited on them. Their condition at any time may be ascertained by weighing a test-object removed from the solution. In some electro-plating establishments the silvering solution is kept constantly stirred by simple mechanical arrangements; in others, continual motion is given to the suspended articles. On being removed from the vats the plated articles are well brushed with brushes of fine brass wire attached to a lathe, and cleaned with fine Calais sand; they are afterwards polished on revolving brushes with rottenstone, then by hand with soft leather and rouge, and, lastly, with the naked female hand. A lasting polish is given to some articles by burnishing with a burnisher formed of highly polished hardened steel, bloodstone, agate, or flint. The process of electro-gilding on the large scale is nearly the same as that of electro-plating or silvering, but, of course, plates of gold are suspended in the solution instead of silver plates.

Electro-gilding is effected in much the same way as electro-silvering. It is found, however, that magneto-electricity cannot be employed with advantage. Various gilding solutions are in use, but preference is usually given to the double cyanide of gold and potassium. The solution is generally used hot, its temperature ranging from 130° F. to the boiling-point. If the object to be gilt is not of copper, it is usual to coat it with an electro-deposit of copper before submitting it to the gilding solution. The coating of gold is generally very thin, and only a few minutes' exposure to the hot solution is necessary to effect its deposition. When the solution is fresh, a copper anode may be employed, its place being taken by a small gold electrode after the solution has been in work for some time. The presence of copper in the solution imparts a full reddish color to the electro-deposit of gold; and the tone of the metal may also be modified by the presence of salts of various other metals, such as those of silver. Sometimes only part of an object is to be gilt, such as the inside of a silver-plated cream-jug; in this case the vessel would be filled with the gilding solution, in which the anode of the battery is immersed. Gold is sometimes deposited not as a coating upon other metals, but as an electrotype in gutta-percha or in plaster moulds; small objects of elaborate workmanship being thus produced in solid gold, without the workmanship of the chaser and engraver.

Although copper, silver, and gold are the metals to which the attention of the electro-metallurgist is usually restricted, it should be remembered that he is also able to obtain electro-deposits of a very large number of other metals. Many of these are not practically used, but one of them has of late years become of considerable importance. This is the metal *nickel*. In 1869 Dr. Isaac Adams of Boston, Mass., patented a process, now carried out on a large scale in this country, for depositing nickel from solutions of various double salts, especially from the sulphate of nickel and ammonium. The metal is deposited as a very thin but excessively hard coating, and has the advantage of not readily tarnishing or corroding even in a moist atmosphere. Hence it has become common to electro-nickel iron and steel objects for use on board ship, as well as gun-barrels, sword-scabbards, harness furniture, gas-burners, and various articles for household use.

Iron, like nickel, may be deposited from its double salts, and excellent results have been obtained by Klein, of St. Petersburg, with the double sulphate of iron and ammonium. Engraved copper-plates are much harder when faced with electro-deposited iron than when unprotected, and they consequently yield a much larger number of impressions before losing their sharpness. Plates for printing bank-notes have been treated in this way.

Not only can the electro-metallurgist deposit simple metals, such as those noticed above, but he is able likewise to deposit certain *alloys*, such as brass, bronze, and German-silver. The processes by which this can be effected are not, however, very generally used.

Among the minor applications of *E.-M.* we may mention the process of electrotyping flowers, insects, and other delicate natural objects. These are first dipped for a moment in a warm solution of nitrate of silver in alcohol, and then exposed to a reducing liquid, such as a solution of phosphorus in bisulphide of carbon; an electro-deposit may then be thrown down upon this metallized surface. Daguerreotypes are sometimes improved by coating them with a very delicate film of electro-deposited gold. Again, in some of the modern photographic processes for printing, copper electrotypes are taken directly or indirectly from the bichromatized gelatine. Of late years, too, a method of refining crude copper by means of *E.-M.* has been introduced, and is now successfully carried out on a large scale. Slabs of blister-copper are plunged into a solution of sulphate of copper, and form the anodes of a battery; the copper then dissolves, and is deposited in a condition of great purity at the opposite pole, most of the impurities sinking to the bottom of the depositing vat. The process should be restricted to copper which is free from any metals likely to be deposited along with the metal under purification.

Various solutions for plating and gilding have been recommended. We give below those generally employed.

1. Solvent solution. Cyanide of potassium, 2 oz.; distilled water or rain-water, 1 pint; dissolve. Other proportions may be employed. Used as a general solvent for salts of silver, gold, and platinum. — 2. Silver solution. Oxide of silver (not dried), 1 oz.; the solvent solution (No. 1), 1 pint. Used for the single-cell apparatus, its strength being maintained as the deposition proceeds by a fresh supply of oxide from time to time. — Cyanide of silver dissolved in solvent solution (No. 1). This is the solution generally employed for plating with a separate decomposition cell. — 3. Gold solution. Add to a pint of No. 1 oxide of gold ¼ oz. — Cyanide of gold dissolved in solution of cyanide of potassium (No. 1).

Electrometer, Electroscope, an instrument for detecting the presence and quantity of electricity.

Electrophorus, an instrument for obtaining electricity by means of induction.

Electro-Plating. See ELECTRO-METALLURGY.

Electroscope. See ELECTROMETER.

Electrotint, a mode of engraving in which drawings are made with any substance insoluble in the solution of sulphate of copper. When the design is completed, the plate is immersed in the solution, and a reverse made by the electro-coppering process, and from this copies are printed. The process may be adapted to relief or to plate printing.

Electrotyping and **Stereotyping**. Electrotypes and stereotypes are metallic plates, fac-similes of the face of an engraved block or of a page or "form" of movable type, or of woodcuts and type combined; and no inventions or improvements relating to printing have proven of greater importance to printers, or have conferred greater benefits upon the public at large, than the original discovery of and the later improvements in the methods of making such plates. It has been claimed that, as early as 1660, John Muller, of

Leyden, Holland, made stereotypes. A few years later, Van der Mey, of the same city, soldered the bottoms of the type together, to prevent the pages being knocked over or "pied" previous to or while they were being printed from. Pages thus soldered could not be "distributed," — the "letter" could not be used a second time, and publishers could not afford to thus "lock up" their type. In 1725 Wm. Ged, of Edinburgh, Scotland, conceived the idea that a great saving would be effected in the cost of publishing books if, as soon as a page was set up and corrected, a fac-simile plate could be made, and the type immediately released for recomposition. Ged at once began his experiment, but two years elapsed before he succeeded in making perfect plates. Then came his greatest trials. In his process printers fancied that they saw the ruin of their craft, consequently they opposed it; publishers durst not avail themselves of the invention, and it was some years before it was put to any practical use. An edition of Sallust, published in Edinburgh, in 1736, was, we believe, the first and the only book printed from plates made by William Ged. After this the art was nearly lost sight of until 1796, when the Didots of Paris re-introduced it. They were successful, and within a few years stereotype plates were used to some extent by nearly all the leading printers of Europe. In 1813 stereotyping was introduced into the United States, and foundries were opened in New York, Boston, and Philadelphia.

Electrotyping, as applied to the production of plates for printers' use, is strictly an American art. Electro-plating was practised some years before electrotyping was accomplished, and experiments were made in England and France, with a view to the duplication of letter-press plates by a process similar to electro-plating, but they were not successful. In 1839 Mr. Joseph A. Adams, a wood-engraver, of the city of New York, began a series of experiments with the same end in view, and succeeded so well that, in 1841, an engraving printed from one of his electrotype plates was published in Mape's Magazine. It was not until five years later, however, that the art of electrotyping was reduced to a trade. In 1846 Mr. Daniel Davis, of Boston, a manufacturer of magnetic machines, undertook electrotyping as a business, and produced plates that were such perfect fac-similes of the originals that the superiority of electrotypes over stereotypes was at once acknowledged.

The process for making electrotypes and stereotypes is substantially as follows: The form to be electrotyped is laid, face uppermost, on the projection of the bed of the hydraulic press, to see that its surface is level and entirely free from all foreign matter, and that it is securely "locked up." When satisfied that it is all correct, the form is covered with graphite, well brushed in with a fine, soft brush, to prevent the wax mould from adhering to the form. The best moulding composition is simply unadulterated yellow wax, which must be boiled sufficiently long to evaporate all the water, but the utmost care must be taken not to subject it to too high a heat, as to scorch it is to render it worthless. The moulding-case is a flat-bottomed brass pan about a quarter of an inch deep; the inside is quite rough, that the wax may readily adhere to it, but the back is planed smooth and must be kept perfectly clean. Before the composition is ready to pour, the pan is placed on the bench set apart for that purpose and made perfectly level, when the wax is gently poured. If air-bubbles rise to the surface they are touched with the heated "building iron," and the pouring must be finished before the composition begins to cool. The wax when cool presents a smooth even surface. When the wax has partly cooled, but while still warm, it is carefully rubbed over with black lead, using for the purpose a soft brush. The form and the moulding-case both being ready, the operator laps the composition surface on the face of the form; the two are then placed in proper position, and the pressure gradually applied. A few seconds suffice to form the wax mould, and the form is then drawn on the projecting table and the mould lifted from it. — In the mould, of course, we have the reverse of the face of the form, every white spot on the printed page is an elevation in the mould and every letter shown, and every black line in the cut is a hollow; when the plate is finished all this will be again reversed. Now type that is to be electrotyped should always be set up with high "spaces" and "quadrates," as they leave less waste space for the wax to fill up, and insure a sharper mould and a better plate; but where two blank lines come together, or where soft paper is to be used in printing, it is necessary that these blank spaces in the page should be deepened in the plate, else the paper will sink to the bottom of the too shallow cavity, and the printed page present an untidy appearance. This, where the white spaces do not cover more than one or two consecutive lines, is accomplished by the process of "building up." The operation requires a steady hand and a quick eye. It cannot be taught, and can be acquired only after long practice. The tool is called a *building-iron*. In shape it is not unlike a small fire-poker, except that at a point there is an arrow-shaped head. The building-iron is heated sufficiently to readily melt wax, the operator with this tool in one hand and a strip of wax in the other, holds the point of the iron close to the spot where the "building" is to be done, applies the wax, which melts, and running to the sharp point drops off on the mould, — if, perchance, it drops so as to cover the impression of a few letters, the mould is spoiled. — The mould having been properly built, it is now ready for black-leading, this being necessary to give it a conducting surface, without which it could receive no deposit of copper. In small foundries the moulds are black-leaded by hand, but in large establishments there are black-leading machines; after the moulds are well brushed, the surplus is blown out with a bellows and the mould placed in a copper solution. — These vats contain a solution composed of sulphate of copper, dilute sulphuric acid, and water. Sheets of copper half an inch thick and as long as the vats are suspended edgewise in the solution and reach to within a few inches of the bottom of the vat. Thus, the faces of the moulds are directly opposite and but a short distance from the broad surfaces of these copper plates. The broad bands running from the electro-magnetic machine battery to the vats are copper conductors, attached to the positive poles of the battery; on the top of the sides of the vats are the negative conductors; the wires running up and down just at the left of the battery, in combination with a movable break, constitute the "switch," which enables the operator to regulate the electric current. If the current is too strong the copper will be burned and the deposit will be granular; if too weak, the deposit will be but slowly made. To complete the circuit, one end of a strip of brass is attached to the negative conductor, the other end is placed against the edge of the metallized mould. The copper held in solution in the bath is attracted to the mould, and soon forms a shell, the thickness of which depends upon the strength of the current and the length of time the mould remains in the bath. — The time occupied in forming the shell with the acid battery (the old way of doing) is from twelve to fourteen hours, the electric machine battery does the work in two to three hours. $\frac{6}{1000}$ of an inch is about the usual thickness of the shell, though they are made both heavier and lighter, — from $\frac{4}{1000}$ to $\frac{12}{1000}$ of an inch. The required thickness having been attained, the mould is removed and well washed in cold water; it is then placed in an inclined position in a sink and warm water poured over the face; this softens the wax, and the shell is carefully lifted from the mould and thoroughly washed in hot lye. The shell is now to be backed with metal composed of tin, antimony, and lead; but this backing metal would not adhere to the copper, they must be soldered together. The shell is laid face downwards in a backing-pan, which rests on tables whose tops are adjusted to perfect levels by thumb-screws. The interior of the shell is washed with muriate of zinc, and a sheet of rolled solder is spread over its surface. The pan and shell are then floated in the molten backing-metal to melt the solder. The pan is then placed on the level table, and the backing metal poured on to the copper shell. When the plate has cooled it is removed from the backing pan; the waste edges are sawn off. It then goes to the finishing-bench, where expert men straighten it (for in cooling it has probably warped a trifle, and the face must be made level), and look it over carefully to detect and correct any imperfections. It then goes to the planing-machine, and the back is rough planed; from there back to the finishing-bench again, where it is completely straightened; then to the smooth planers, where the plate is reduced to its proper thickness and the back made perfectly smooth, and from there to the bevelling-machine, if bevelled edges are required. Routing is cutting down the face of the plate, where any considerable white space is to show in the printed page, as beside cuts or between widely separated lines. Small movable cutters, revolving very rapidly, do the work. If the plate is to be mounted, it is taken to the proper bench, and is there fastened to mahogany blocks, thoroughly seasoned and planed by machinery to the proper height. The blocked plate is then squared at the side planes, and if to be mortised for the insertion of lines of type, that operation is performed by the aid of the drilling-machine and the gig-saw.

Finally it reaches the finishing-bench, where it receives the final touches.

Stereotyping by the Papier-Mache process is a quite recent invention. It is the simplest and quickest method of making ordinary plates, and the only method by which circular plates can be made. To prepare the matrix a sheet of soft, unsized paper is laid on any smooth surface and three or four sheets of tissue-paper pasted on it. To make the mould, a piece of this prepared paper, the type having been previously oiled, is spread over the form, and gently beaten with a soft brush; the paper is thus forced into every crevice. A second sheet of soft paper is then pasted on the back of the matrix and the beating continued until the mould is of sufficient depth. The form is then removed to the drying-table, which is heated by steam. The matrix is covered with four thicknesses of soft woollen blanket, and a light pressure is applied, to prevent the mould from warping. After a minute or two the press is unscrewed, the blanket removed, and the mould lifted from the form. It is then placed between heated iron plates in the casting-machine, the type metal poured in, and in a second the stereotype is ready for the finishing processes. — In casting plates for the great daily papers, special casting-boxes and other appliances are used which we have not room to describe. They have cast and finished such plates in less than 9 minutes, and within 19 minutes from the time the last lines were placed in the form of type, the mould was taken, the plate cast, finished, put on the printing-press, and the press was in motion. It was not until this process of stereotyping was perfected that the present fast presses were practicable. These moulds may be used to make several casts.

We are indebted for the foregoing sketch to Messrs. Crum & Kingler, proprietors of the New York Manhattan Electrotype Foundry, one of the finest and most complete electrotype and stereotype foundries in the country. There, and in some few other establishments of New York, Philadelphia, and Boston, are daily produced those matchless plates which have placed American art far above the standard of English and French electrotyping.

Electuary, a sweetened medicine, of conserves and powders in a soft mass, of the consistence of thick honey.

Elemi, a resinous substance obtained from incisions made during dry weather through the bark of the *Amyris elemifera*, a tree which grows in Brazil and other parts of S. America. It is brought to us in yellow, tender, transparent lumps, which readily soften by the heat of the hand, have a strong aromatic odor, a hot spicy taste, and contain about 12½ per cent of ethereous oil. *E.* is used in making lacquer, to give toughness to the varnish. It is also used in medicine.

Elephant, the largest of quadrupeds, which is domesticated in the East and trained to service. The wild animals are also hunted for their tusks, which furnish the ivory of commerce, and their back teeth, or grinders, are also useful. The feet, trunk, etc., are eaten by the hunters; the tail is used for a fly-flapper. See IVORY.

Elephant-Paper, a very large kind of drawing-paper, 28 inches by 23.

Elevation, a plane; a geometrical perspective representation of a building, measured vertically in respect of the horizon.

Elevator, "a machine for transferring grain by raising it from the car, a bin, or the hold of a ship, to an elevated hopper, whence it is discharged by any one of a series of spouts directed to a bin for storage, or to the hold of a boat, a car, or to a run of stones. *E.* are used in flour-mills to carry the wheat to the upper story, where it is cleaned in the smut-mill; also to raise wheat, so cleaned, to a bin, whence it proceeds to the stones; also to raise the meal to the bolt, etc., as the case may be. *E.* are also used in many other machines for raising small objects or materials. — 2. A platform or cage in a warehouse, hotel, mine, or elsewhere, for raising or lowering persons, goods, or materials to or from different floors or levels. — A building specially constructed for elevating, storing, and loading grain into cars or vessels. These structures are very capacious both as to the capacity for handling and storing, but the construction is very simple. An *E.-leg*, so called, reaches into the bin, into which the contents of the wagons or cars are discharged. A strong belt, carrying a series of buckets, travels over a drum at the lower end and also over one at the upper end, where the buckets tip over and discharge into the upper bin. This has valved spouts, which direct the contents into either one of two deep parallel bins. The floors of these bins are over the tracks, and valves in the floor allow the contents of the bins to be discharged into cars or ships, which are brought beneath." (*E. H. Knight's American Mechanical Dictionary.*) — 4. An instrument with which surgeons raise any depressed portion of bone, especially of the cranial bones.

Eliot Fire Insurance Co., located in Boston, Mass., was organized in 1872. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000. Net surplus, $127,051.30. Total cap. and surplus, $327,-051.30. Risks in force, $7,923,385. Premiums, $98,135.37. Premiums received since the organization of the Co., $594,230.65. Losses paid, $198,-787.65. Cash dividends paid to stockholders, $90,000.

Elixir, in pharmacy, a name formerly applied to various compound tinctures, and to preparations supposed to contain the quintessence of other substances; still applied to several popular remedies. In popular parlance, an invigorating cordial.

Ell, an English measure of length equal to 45 inches, but now superseded by the imperial yard. The term is, however, still employed in designating the width of certain goods. The ell is also an old measure which varies in length in the countries of Europe where it is still sometimes used; the Dutch or Flemish ell is 27 inches. The proportion between Dutch ells and English yards is generally taken at 3 yards to 4 ells; but the real rate is 100 yards to 129$\frac{3}{7}$ ells. In Leipsic the ell is 22¼ inches; in Prussia 26¼ nearly. In Trieste the woollen ell is 26.6 imperial inches; that for silk 25.22 inches. The German ell is 21$\frac{5}{8}$ inches; the Scottish ell rather more than 37 inches.

Elm, a graceful forest-tree, of which there are several varieties, forming the genus *Ulmus* (Fig. 160). It attains to a great size, and lives to a

Fig. 160. — ELM.

great age. Its trunk is often rugged and crooked, and it is of slow growth. The color of the heart-wood of elm is generally darker than that of oak, and of a redder brown. The sap-wood is of a yellowish or brownish white, with pores inclined to red. It is in general porous and cross-grained,

sometimes coarse-grained, and has no large septa. It has a peculiar odor. It twists and warps much in drying, and shrinks very much both in length and breadth. It is difficult to work, but is not liable to split, and bears the driving of bolts and nails better than any other timber. The wood of the *Ulmus Americana*, like that of the European elm, is of a dark brown color, and is liable to decay when exposed to the alternations of moisture and dryness; and when cut transversely or obliquely to the longitudinal fibres, it exhibits the same numerous and fine undulations; but it splits more easily and has less compactness, hardness, and strength, weighing, when perfectly dry, only 33 pounds to a cubic foot. The principal uses to which this timber is applied are for making naves or hubs to wheels, for piles and foundation-pieces to mills, canal-locks, and for many other purposes where strength is required, and the work is constantly buried in water or mud. In the State of Maine it is occasionally employed for the keels to vessels, for which purpose it is well adapted on account of its size. It is also employed for the swingle-trees of the carriages of great-guns; and in some parts of the country, where more appropriate wood is not to be found, it is used for making ox-yokes, sleds, and other implements of husbandry. The bark, which is easily detached from the tree during 8 months of the year, is sometimes used for making bast-mats, ropes or withes, and for the bottoms of chairs. The wood, when dry, makes excellent fuel, and, when burned, yields a large proportion of ashes, which abound in alkaline salts.

Elmira and Williamsport R.R. runs from Williamsport, Pa., to Elmira, N. Y., 76.70 m. This Co., whose offices are in Philadelphia, was chartered in 1832 as the Williamsport & Elmira R.R., was reorganized under present name and the road leased in 1863 to the Northern Central R.R. Co., for 999 yrs., for $165,000 per annum and interest on equipment. *Financial statement:* Cap. stock, common, $500,000; preferred, $500,000; funded debt, 1st mortgage 7% bonds, payable 1880, $1,000,000; income 5% bonds, payable 1862, $570,000; real estate (Elmira) mortgage, 7%, $50,000.

Elvas Plums, a kind of dried prune, a dessert fruit sold in boxes.

Embale, to pack up or bind goods in a bale or package.

Embank, to enclose with a mound; the term is applied chiefly to banks of earth, by which water is kept out from land that has been reclaimed, or that is liable to inundation.

Embankments, artificial mounds of earth, raised by the sides of rivers, fens, etc., or for levelling the line of road for a railway.

Embar, a liquid measure of Sweden, equal to 20⅔ gallons.

Embargo, a temporary injunction by the supreme government of a country prohibiting individuals or commodities from being conveyed beyond seas, or vessels from leaving their ports. There are two kinds of *E.*, the one where the sovereign detains the vessels of an adverse nation in his harbors, the other where he suspends the sailing of those of his own subjects. The former generally takes place on a declaration of war; the latter is a matter of internal administration, involving, in this country, as in England, questions as to the power of the National Government. On the issuing of a declaration of war, it is not unusual to lay an embargo on such vessels of the country declared against as may happen to be in the ports of the government declaring, or only on vessels laden with articles of which it is thought expedient to prevent the exportation. This step is reconciled with the old principles of the law of nations by the view that the *casus belli* and virtual declaration will have taken place before the literal proclamation. With regard to the right of placing an *E.* on American ships or subjects, it is of a wider range in time of war than in time of peace, and seems in the former case to embrace all those occasions where the prohibition can be presumed necessary or useful to the national defence. In time of peace, however, the government must exercise the right within the limits which the law allows, the extent of which is somewhat doubtful. In 1766 a proclamation was issued in England, prohibiting the exportation of corn, on account of the risk of famine; but it was thought necessary to pass an act of indemnity (7 George III c. 7), which characterized the order as one that "could not be justified by law, but was so much for the service of the public, and so necessary for the safety and preservation of the British people, that it ought to be justified by Act of Parliament." The proprietors of the embargoed ships were indemnified, which they would not have been had the *E.* been legal. Loss by *E.* is one of those which underwriters have to make good; while a breach of *E.* is one of those breaches of warranty which release them from their obligation. An *E.* laid on by the government of the country in whose port a vessel is, being but a temporary suspension, does not dissolve a contract for the employment of the vessel. But in the case of an American citizen freighting a vessel which is subject to *E.* on account of hostility to the country to which the ship belongs, he will not be responsible for terminating the contract if the object of the voyage would be likely to be defeated by delay.

Embark, to ship; to proceed on board a vessel or boat; to engage or take part in any business.

Embellishment, the act of adorning or enriching; ornament, decoration.

Embers, small lighted coals or the ashes of burning wood.

Embezzlement, in law, a peculiar form of theft which is distinguished from the ordinary crime in two points: 1. It is committed by a person who is in the position of clerk or servant to the owner of the property stolen; 2. The property when stolen is in the possession of such clerk or servant. The definition of *E.* as a special form of theft arose out of the difficulties caused by the legal doctrine that to constitute larceny the property must be taken out of the possession of the owner. Servants and others were thus able to steal with impunity goods entrusted to them by their masters. An *E.* is in substance, and essentially, a larceny, aggravated rather than palliated by the violation of a trust or contract, instead of being, like larceny, a trespass. In England, the crime is made a felony, punishable by not more than fourteen nor less than five years of penal servitude. In this country the punishment varies in the several States, but is generally scarcely less severe.

Sect. 5209 of the U. States Revised Statutes, relating to *National Banks*, is as follows: "Every president, director, cashier, teller, clerk, or agent of any association who embezzles, abstracts, or wilfully misapplies any of the moneys, funds, or credits of the association, or who, without authority from the directors issues or puts in circulation any of the notes of the association, or who, without such authority, issues or puts forth any certificate of deposit, draws any order or bill of exchange, makes any acceptance, assigns any note, bond, draft, bill of exchange, mortgage, judgment, or decree; or who makes any false entry in any book, report, or statement of the association, with intent, in either case, to injure

or defraud the association or any other company, body politic or corporate, or any individual person, or to deceive any officer of the association, or any agent appointed to examine the affairs of any such association: and every person who with like intent aids or abets any officer, clerk, or agent in any violation of this section, shall be deemed guilty of a misdemeanor, and shall be imprisoned not less than five years nor more than ten."

E by seamen. "For wilfully damaging the vessel, or embezzling or wilfully damaging any of the stores or cargo, any seaman is punishable by forfeiture out of his wages, of a sum equal in amount to the loss thereby sustained, and also, at the discretion of the court, by imprisonment for not more than 12 months." (*Section* 4595 *of U. States Revised Statutes.*) If the individual who has committed the wrong be unknown, those of the crew upon whom the presumption of guilt rests, stand as sureties for each other, and they must contribute ratably to the loss. Some of the cases in the books have established a general contribution from all the crew for such *E.*, even when some of them were in a situation to repel every presumption of guilt; but neither public policy nor principles of justice extend the contribution or forfeiture of wages for such *E.*, beyond the parties immediately *in delicto.*

Embossing is the art of producing raised portions or patterns on the surface of metal, leather, textile fabrics, cardboard, paper, and similar substances. Strictly the term is applicable only to raised impressions produced by means of engraved dies or plates brought forcibly to bear on the material to be embossed, by various means, according to the nature of the substance acted on. Thus raised patterns produced by carving, chiselling, casting, and chasing or hammering are excluded from the range of embossed work. *E.* supplies a convenient and expeditious medium for producing elegant ornamental effects in many distinct industries; and especially in its relations to paper and cardboard its applications are varied and important. Crests, monograms, addresses, etc., are embossed on paper and envelopes from dies (see DIE-SINKING) set in small handscrew presses, a force or counter die being prepared in leather faced with a coating of gutta-percha. The dies to be used for plain *E.* are generally cut deeper than those intended to be used with colors. Color *E.* is done in two ways, — the first and ordinary kind being that in which the ink is applied to the raised portion of the design. The color in this case is spread on the die with a brush, and the whole surface is carefully cleaned, leaving only ink in the depressed parts of the engraving. In the second variety — called cameo *E.* — the color is applied to the flat parts of the design by means of a small printing-roller, and the letters or design in relief are left uncolored. In *E.* large ornamental designs, engraved plates, or electrotypes therefrom are employed, the force or counterpart being composed of mill-board faced with gutta-percha. In working these, powerful screw-presses, in principle like coining or medal-striking presses, are employed. *E.* also is most extensively practised for ornamental purposes in the art of bookbinding. The blocked ornaments on cloth covers for books, and the blocking or imitation tooling on the cheaper kinds of leather-work, are effected by means of powerful *E.* or arming presses. (See BOOKBINDING.) For impressing embossed patterns on wall-papers, textiles of various kinds, and felt, cylinders of copper, engraved with the patterns to be raised, are employed, and these are mounted in calender frames, in which they press against rollers having a yielding surface, or so constructed that depressions in the engraved cylinders fit into corresponding elevations in those against which they press. The operations of E. and color printing are also sometimes effected together in a modification of the ordinary cylinder printing-machine used in calico-printing, in which it is only necessary to introduce suitably engraved cylinders. For many purposes the *E.* rollers must be maintained at a high temperature while in operation; and they are heated either by steam, by gas jets, or by the introduction of red-hot irons within them. The stamped or struck ornaments in sheet metal, used especially in connection with the brass and Britannia metal trades, are obtained by a process of *E.* — hard steel dies with forces or counterparts of soft metal being used in their production (see BRASS). A kind of embossed ornament is formed on the surface of soft wood by first compressing and consequently sinking the parts intended to be embossed, then planing the whole surface level, after which, when the wood is placed in water, the previously depressed portion swells up and rises to its original level. Thus an embossed pattern is produced which may be subsequently sharpened and finished by the ordinary process of carving.

Embouchure, the mouth of anything, as of a river or harbor; of a cannon, a bottle, a wind instrument, etc.

Embrocation, a pungent oil, or medicinal spirit, used as an external application to moisten or rub diseased parts of the body.

Embroidery is a general name for many different modes of giving pattern and ornament to textile fabrics. The most evident mode is to take a piece of woollen cloth, net, gauze, etc., and apply any decorative patterns to it by needle and thread. The ancients were very fond of this method of producing rich tissues; and in India, China, and Persia the art is extensively practised at the present day, especially with gold and silver threads, spangles, beads, bugles, feathers, almost, anything, in fact, that has richness and diversity of color. The *sampler* is a well-known kind of juvenile *E.*-needlework upon an open canvas. *Berlin-wool work* is a higher kind, but similar in principle; it obtained its name from having been introduced first at Berlin, where a print-seller invented the convenient pattern papers which are used in this work. *Lace E.* and *muslin E.* describe themselves in their names. *Tapestry* work is described under TAPESTRY. The machinery employed in most sorts of *E.* consists simply of some kind of frame in which the material can be stretched out flat. There are, however, *embroidering-machines* which increase many fold the rapidity of working. One such machine, invented by M. Heilmann, of Mülhausen, enables a woman to embroider with 100 needles at a time. The needles have a point at each end, and an eye in the middle; and the action bears some resemblance to that of the well-known sewing-machine, except in having the web or cloth upright instead of horizontal. The needles are attached to a kind of carriage; the carriage travels to and fro towards the web and back; the needles convey their threads in and out of the web at every movement of the carriage; pincers grasp the needles at each end alternately, to pull them through, and prepare them for their return journey; and then a pattern becomes incorporated with the web by every distinct needle.

Imp. duty: manuf. of cotton, linen, or silk, if embroidered or tamboured, in the loom or otherwise, by machinery or with the needle, not otherwise provided for, 35 per cent. — Articles embroidered with gold and silver, or other metal, 35 per cent.

Emerald [Fr. *émeraude;* Ger. *Smaragd;* It. *smeraldo;* Sp. *esmeralda*], a beautiful ornamental stone of a peculiar green color, which it derives from the intermixture of a small portion of chrome. The common form of its crystal is the hexahedral

prism; transparent or translucent; lustre vitreous; sp. gr. 2 75. It scarcely differs from beryl, except in color, and ranks next to the diamond in value. The finest are brought from Peru, but fair varieties are found in Bavaria, Siberia, and India. A fine *E.* weighing 4 or 5 gr. is worth about \$5 per gr.; one of 10 gr. about \$10 per gr.; one of 15 gr. \$15 to \$20 per gr.; and so on in proportion to the increase in size. One of 24 gr., if of pure water, is worth about \$500. *Imp.* duty, same as diamond.

Emerald Green. See Bice.

Emeraldine. See Aniline (Blue and Green).

Emery is an impure, amorphous, compact, and opaque variety of corundum, and consists of alumina, with a small percentage of silica and peroxide of iron. It occurs in Spain, the isles of Greece, and other localities, and derives its name from Cape Emeri, in the island of Naxos. Its hardness is so great that it scratches and wears down nearly all minerals except the diamond; hence the use of its powder for cutting and polishing glass and various other hard substances.

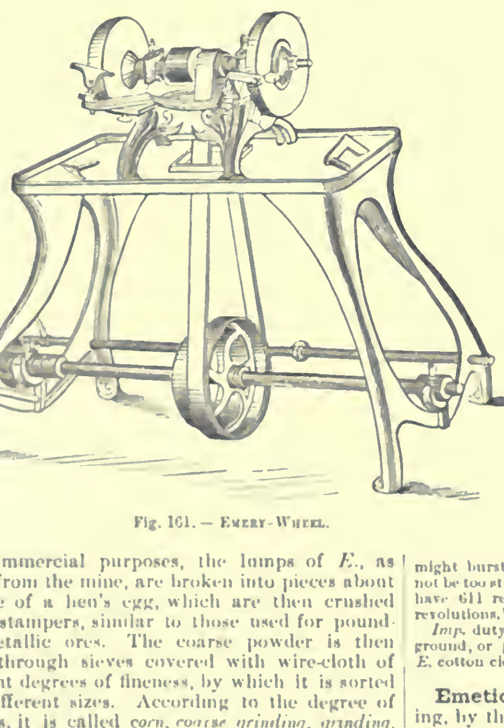


Fig. 161. — Emery-Wheel.

For commercial purposes, the lumps of *E.*, as taken from the mine, are broken into pieces about the size of a hen's egg, which are then crushed under stampers, similar to those used for pounding metallic ores. The coarse powder is then sifted through sieves covered with wire-cloth of different degrees of fineness, by which it is sorted into different sizes. According to the degree of fineness, it is called *corn*, *coarse grinding*, *grinding*, *fine grinding*, *superfine grinding*, *coarse flour*, *flour*, *fine flour*, and *superfine flour E.* In many instances *E.* powder cannot be conveniently used unless it is cemented to some substance which can be held in the hand, as paper, cloth, and sticks.

E.-cake consists of *E.* mixed with a little beeswax, so as to constitute a solid lump, with which to dress the edges of buff and glaze wheels. The ingredients should be thoroughly incorporated by stirring the mixture while fluid, after which it is frequently poured into water, and thoroughly kneaded with the hands, and rolled into lumps before it has time to cool. The *E.*-cake is sometimes applied to the wheels while they are revolving; but the more usual course is, to stop the wheel, and rub in the *E.*-cake by the hand. It is afterward smoothed down by the thumb.

E.-cloth only differs from *E.*-paper in the use of thin cotton cloth instead of paper, as the material upon which the *E.* is fixed by means of glue. The *E.*-cloth, when folded around a file, does not ply so readily to it as *E.*-paper, and is apt to unroll. Hence smiths, engineers, and others prefer *E.*-paper and *E.*-sticks; but for household and other purposes, where the hand alone is used, the greater durability of the cloth is advantageous.

E.-paper is prepared by brushing the paper over with thin glue, and dusting the *E.*-powder over it from a sieve. There are about six degrees of coarseness. Sieves with 30 and 90 meshes per linear inch are in general the coarsest and finest sizes employed. When used by artisans, the *E.*-paper is commonly wrapped around a file or slip of wood, and applied just like a file, with or without oil, according to circumstances. The *E.*-paper cuts more smoothly with oil, but leaves the work dull.

E.-sticks are rods of board, about 8 or 12 inches long, planed up square, or with one side rounded like a half-rounded file. Nails are driven into each end of the stick as temporary handles; they are then brushed over, one at a time, with thin glue, and dabbed at all parts in a heap of *E.*-powder, and knocked at one end to shake off the excess. Two coats of glue and emery are generally used. The *E.*-sticks are much more economical than *E.*-paper wrapped on a file, which is liable to be torn.

E.-wheels are "solid wheels consisting of a mixture of powdered *E.* with shellac, fused and rolled upon a stick. When carefully mounted upon a mandril (Fig. 161) and run at a high speed, the abrading power of such wheels is wonderful. They will instantly take the teeth off the hardest file and reduce it to a plane, smooth surface, or will cut away parts of chilled castings that a file will not touch. The grains of *E.* are the cutting-points or teeth, and do not grow dull although brought into contact with metal hard enough to turn the teeth of a file at one stroke. The rapidity of abrasion depends not only on the velocity of movement, but upon the size of the grains of *E.* For very heavy work, such as taking the rough edges off castings, very coarse *E.* is used, while the finer sorts are made into wheels for fine grinding and surface work on brass or steel. In using *E.*-wheels care must be taken to maintain the proper speed, and not to press the work too strongly against the surface. If too much pressure is used, the wheels will not cut so fast, and are liable to wear away unequally and to get out of true. A rest should always be used to support the work and prevent it from vibrating upon the wheel. The bearings should be kept in good order and well lubricated. Good *E.*-wheels are uniform in texture. The material with which the *E.* is combined must have great cohesive strength to resist the tendency of the wheels to fly asunder when revolving at high speed, and to retain the grains of *E.* firmly, and yet wear away evenly, leaving the cutting angles exposed, and not glaze or 'gum up.' It must not soften or melt under the heat generated by the friction in cutting the work, and must be free from noxious qualities. As such wheels are run at high velocities, they require to be very carefully and exactly hung, and to be kept perfectly true so as to prevent vibrations. They should not 'wedge' upon the mandril, or even fit it closely, for expansion by heat might burst the wheel, and the flanges at the side should not be too strongly screwed up. A wheel 36 in. in diameter may have 611 revolutions per minute, and one of 12 in 1,800 revolutions." — *Johnson's Encyclopædia.*

Imp. duty: *E.* ore or rock, \$6 per ton; *E.* manufactured, ground, or pulverized, 1 ct. per lb.; *E.* grains, 2 cts. per lb.; *E.* cotton cloth, 35 per cent.

Emetics, a class of drugs which produce vomiting, by the influence of some peculiar and specific action on the nerves of the stomach, and independent of smell, taste, or local irritation. The principal *E.* are ipecacuanha and tartar *E.* (tartarated antimony), and their preparations; and the sulphates of zinc and copper.

Emigration is the act of leaving the country or place in which one has previously resided, with the view of residing in some other country or place. Persons so leaving the place of their residence are called emigrants; and the term "immigrants" is employed to designate persons arriving from a distance in some place or country with the intention of settling in it. Persons leaving a country for a while, to which they intend to return, are not reckoned emigrants. This term is

appropriated to those who leave their present habitations to establish themselves permanently elsewhere. The motives which lead to *E.* are various in the extreme; but, whatever its immediate cause may be, all emigrants expect either to avoid some considerable evil, or to improve or amend their situation. The striking modern form of *E.* is the removal of individuals and families from their native seats to distant countries in large numbers, yet without concert and without apparent distress, silently and intelligently, the emigrants knowing what they are leaving and whither they are going. *E.* of this kind, like the commerce in commodities, does not advance rapidly for a long period. The first adventurers have often a rough experience, and do not invite others, but gradually the number who succeed increases, and in their letters home encourage relatives and friends to follow their example, and not unfrequently supply the means of acting upon their advice. This, in a constant and cumulative form, comes to have more real and wholesome influence than all the *E.*-aid societies ever established, however useful these may have been in their place. The traffic of the steam navigation companies during the last thirty years would show how largely the volume of free and well-considered *E.* has thus been increased; and, indeed, it may be observed that *E.* of this kind has received much the same impetus as material commerce from the ocean steamers, railways, telegraphs, and other greatly improved means of transmission. The movement is liable to its own fluctuations; it ebbs and flows from one year to another; but of its permanence and extension there can be no reasonable doubt. The year 1847, in which the *E.* from Great Britain rose to 258,270, marks the beginning of unwonted increase, sustained over many years in succession, and, with some exceptional years, sustained, indeed, to the present time. The average annual *E.* in the five years ending 1853 was 323,002, whereas from 1815 to the same year (1853) it had only been 97,269. The Irish famine, ensuing on an almost total failure of the potato crops, was the first in the order of events to which this remarkable increase of *E.* is to be ascribed; but the Californian and Australian gold discoveries, the failure of the European revolutions of 1848, and the wonderfully growing prosperity of the U. States, prolonged the impulse which had first been given by a sharp distress affecting more parts of Europe than Ireland, and placed *E.* on the more voluntary and substantial basis which has characterized it of late years. The way was made so plain by the ocean steamers and railways, which trade and capital were bringing into rapid action, that larger numbers of people saw the advantage of passing over great distances from one hemisphere to another. It was not until 1855 that any relapse occurred in the large annual totals of *E.* from Great Britain; and so late as the ten years from 1869 to 1878 the average number per year of emigrants from British ports was 217,287. It must be said, however, that during these ten years British emigration was to a great extent balanced by immigration. During the year 1877, for instance, there were 93,557 immigrants, British and foreign, which, deducted from the total of 104,387 emigrants, left an excess of but 10,830 emigrants.

The following table exhibits the number of emigrants from Great Britain to British North America, the U. States, and Australasia, and the total number (the latter figure including the comparatively small number going to other than these three destinations) in each of the 64 years from 1815 to 1878.

Year.	British N. America.	U. States.	Australasia.	Total.
1815....	680	1,209	....	1,889
1816....	3,370	9.022	....	12.392
1817....	9 797	10.280	....	20,077
1818....	15,136	12,429	....	27,565
1819....	23.534	10.674	....	34,208
1820....	17,921	6,745	....	24,665
1821....	12,955	4,958	....	17 913
1822....	16.013	4,137	....	20,150
1823....	11,355	5,032	....	16.387
1824....	8,774	5,152	....	13.926
1825....	8,741	5.551	485	14.777
1826....	12,818	7,063	903	20,784
1827....	12,648	14,526	715	27,889
1828....	12,084	12,817	1,056	25.963
1829....	13,307	15,678	2,016	31,001
1830....	30.574	24,887	1,242	60,703
1831....	58,067	23,418	1,561	83,046
1832....	66,339	32,872	3,733	102.944
1833....	28,808	29,109	4,093	62,010
1834....	40.060	33,074	2,800	75,934
1835....	15,573	26,720	1,860	44.153
1836....	34,226	37,774	3,124	75.124
1837....	29,884	36,770	5,054	71.708
1838....	4,577	14,332	14,021	39,930
1839....	12,658	33,536	15,786	61.980
1840....	32 293	40,642	15,850	89,785
1841....	38.164	45,017	32,625	115,806
1842....	54,123	63,852	8,534	124,509
1843....	23.518	28,335	3,478	55,831
1844....	22,924	43,660	2,229	68,813
1845....	31,803	58,538	830	91,171
1846....	43,439	82,239	2,347	128,025
1847....	109,680	142.154	4,949	256.783
1848....	31.065	188,233	23,904	243 202
1849....	41.367	219 450	32,091	292,908
1850....	32,961	223,078	16,037	272,076
1851....	42,605	267,357	21,532	331,494
1852....	32,876	244,261	87,424	364,561
1853....	34,522	230,885	61,401	316,808
1854....	43.761	193,065	83,237	320,063
1855....	17.966	103.414	52,309	173,689
1856....	16,378	111,837	44,584	172,799
1857....	21,001	126,905	61,248	209,154
1858....	9.704	59,716	39,295	108.715
1859....	6,689	70,303	31,013	108,005
1860....	9,786	87,500	34,302	131,588
1861....	12.707	49,764	23,738	86,209
1862....	15,522	58,706	41,843	106,071
1863....	18.083	146,813	53,054	217.950
1864....	12.721	147,042	40,942	200,705
1865....	17,211	147,258	37,283	186,757
1866....	13,255	161,000	24,097	198,352
1867....	15.503	159,275	14,466	189,244
1868....	21.062	155,532	12,809	189,403
1869....	33,891	203,001	14,901	251,793
1870....	25,295	196,075	17,065	238,435
1871....	32,671	198,843	12,227	243,741
1872....	32.205	233,747	15,876	281 828
1873....	37.208	233,073	26,428	296.709
1874....	25,450	148,161	53,958	227,569
1875....	17.378	105,046	35,525	157,949
1876....	12.327	75,533	33.191	121,051
1877....	9,289	64,027	31,071	104,387
1878....	10,147	38,082	57,690	105,919
Total..	1,558,449	5,569,184	1,263,732	8,391,365

Average annual *E.* for Great Britain from 1815 to 1878, 135,649.

The increase in *E.* was not confined to Great Britain. From the N. of Europe — from Germany and Scandinavia — there has been during the same period a largely increased *E.*, proceeding under much the same incitements and facilities as from England, Scotland, and Ireland. From France the *E.* has not been so marked as from many less populous countries. The German race have peopled the U. States so largely as to have become a prominent element in the American republic; but no one hears of the French as one of the constituents of a commonwealth which they helped materially to found. The *E.* of France follows her own colonies and traditions chiefly; it is found in Louisiana and in Canada, and almost everywhere discursively and thinly; and in much the same way the Span-

iards and Italians still lean in their *E.* to La Plata and S. America, where there is a trace of ancestry, and their language is spoken. The industrial motive and faculty, however, now draw emigrants from all the European nations into the most various parts of the New World. The Chinese themselves — the most numerous while the most isolated nationality in the world — have also become emigrants in large numbers, though it is obvious that the Chinese *E.* to our Pacific coast has not for its object a permanent change of country, and is more of the nature of a transfer of labor for a term of years than a definite *E.* of both sexes and of families. A constant coming and going is the feature of *E.* from China. The Chinese have a superstitious desire to die within the borders of their own sacred land. Nevertheless, their strong and persistent movement to the Western world is a significant phenomenon. It has broken through all restraints at home, and it has held its ground to this day, in the face of no little social hostility, from San Francisco to New York and other cities on the Atlantic seaboard (see CHINA). *E.* is now so widely practised, and has been rendered by improved means of transit so safe and expeditious, that its continued progress is not only sure, but one may foresee, from the various forces in play, that at no distant time it will have become, over the largest portion of the world, as familiar as migration from one province of the same country to another. The attitude and duties of states, and of the populations of states, towards a movement which comes into contact at many points with existing laws and interests — laws of naturalization, military conscription, and allegiance, with asserted rights of labor, and with social, religious, and international prejudices — have thus become questions of much importance. Nothing is more certain than that nearly all the old countries suffered in past times from want of *E.*, unless it be that all the new countries have been greatly benefited by it. Leaving China out of view, where foreign immigrants have only been tolerated under treaties extorted by force of arms, there has been a general approval of *E.* on the one hand, and of immigration on the other. In Great Britain the population are singularly free to choose either their own country or its colonies or other countries as the place of their abode. They are under no compulsory military service; and *E.* has been actively encouraged by societies and protected by the government for half a century. The greatest obstacle to free *E.* from the continent would appear to be the system of military conscription. Every German of 20 or 21 years is liable to personal service in the standing army for seven years — three of active service, four in the reserve — and to other five years in the landwehr, with the landsturm behind the landwehr making further demands on the time and liberty of the subject. In France a similar system is now enforced, though under more liberal exemptions. It is but fair to state that Germany, exclusive of Prussia, has up to this time been sufficiently free in its *E.* to have sent to the U. States, from 1820 to 1870, not fewer than 2,207,500 persons, which is nearly as many as those who came from Ireland to this country in the same half-century, viz., 2,700,493. But from Prussia, where the conscription has been longest in rigorous operation, the number of emigrants to the U. States, in the same period, has been only 100,983, and from France 245,812. Though the conscription may not be the sole cause of this, yet the demands made by the great military powers on the drilling and fighting services of the whole youth and manhood of their populations are obviously obstructive to the pursuit of industry and fortune in foreign countries or in colonies. These demands may be relaxed from time to time, while the system itself is maintained; but they are relaxed with a grudge, and the governments acquire inordinate ideas of the irrevocable allegiance of their subjects. If the latter are permitted to emigrate it is under condition of being liable to recall on brief notice to the standards of their country; and an armed truce, such as has prevailed in the most civilized nations of the continent of Europe during five or six years of peace, might soon be as detrimental to free *E.* as war itself, under which it usually ceases for the time. From Russia none can emigrate without permission of the czar; and a similar despotism over the subject is the rule of the Ottoman empire. A state may be within its reasonable and proper line of duty in promoting and aiding either *E.* or immigration. But that the permission of the state should be necessary to the one process or the other is inconceivable, save in some rare and dire emergencies of war or politics. — The duty of states in regard to *E.*, viewed in what must now be the generally accepted light of a necessary and wholesome function of the general economy, thus resolves itself into a duty of regulation and guardianship under the two categories, always presented, of the countries which the emigrants leave, and the countries to which they go. The one are bound to see that emigrant ships are well found and not overcrowded, and that adequate arrangements are made for the provisioning, health, and safety of the passengers in their transit; while the other are bound to give them shelter and guidance on landing, to protect them from imposture, and to see that all pre-engagements made with them be fulfilled. Of the regulations for the reception of immigrants, the arrangements at New York afford probably the best example. No place in the world has had more to do with their reception than our great seaport; and measures have been adopted here by which the abuses once prevailing have been overcome, and at the same time all the arrangements for the comfort, security, and guidance of immigrants have been placed on a satisfactory basis. Emigrant ships are visited six miles from the port by health officers, and any who may be sick or diseased are removed to hospitals under the care of the commissioners of *E.* or the quarantine commission. The others are required to land at Castle Garden, where there is a large rotunda capable of accommodating 4,000 persons, and where every immediate want of the immigrants may be supplied without leaving the depot. Letters may be written for them, or telegrams despatched to friends, or friends may be introduced immediately on their credentials being presented. The utmost care is taken to guard the immigrants from falling into bad hands, and every information is afforded them as to how they shall best proceed in their respective objects. The supervision thus exercised in the port is extended over the railroads to the various parts of the Union to which immigrants may be bound. Besides such arrangements, no less honorable to the authorities of a country than encouraging to the emigrant, direct inducements have frequently been held out to settlers, in the form of grants of land or land at a cheap price, and in assisted or free passages. — The question whether countries receiving emigrants may not be called upon in some cases to check the flow of immigration within their borders is less free of difficulty than any similar

question as regards the countries from which emigrants proceed. An example of what may happen is now seen in Utah Territory, where the Mormons are not only at variance with the republic on so cardinal a point as the civil law of marriage, but almost at open war with the federal jurisdiction. Similar perplexities arise from the Chinese immigrants introducing customs and observances which, though called religious and claiming toleration, can be regarded as contrary to civil order, morality, and decency (see CHINA). Some dilemma of the same sort may even occur in the emigrant-giving countries, as, for instance, when English trades-unionists, while deriving all the profit of a large outward flow of labor, fall upon foreign workmen who immigrate into Great Britain with a violence and disorder which the law has not yet learned or been able to prevent.

Statement of the Number and Sex of Alien Passengers arrived in the U. States from Foreign Countries from October 1, 1819, *to December* 31, 1878: —

Years.	Males.	Females.	Sex not stated.	Total.	Years.	Males.	Females.	Sex not stated.	Total.
1820..........	4,871	2,393	1,121	8,385	1850..........	32,990	26,805	181	59,976
1821..........	4,651	1,636	2.840	9,127	1851..........	217,181	162,219	66	379,466
1822..........	3,816	1,013	2,082	6,911	1852..........	212,469	157,696	1,438	371,603
1823..........	3,598	848	1,908	6,354	1853..........	207,958	160,615	72	368,645
1824..........	4,706	1,393	1,813	7,912	1854..........	256,177	171.656	....	427,833
1825..........	6,917	2,959	323	10,199	1855..........	115,307	85,567	3	200,877
1826..........	7,702	3 078	57	10,837	1856..........	115,846	84,590	....	200,436
1827..........	11.803	5,939	1,133	18,875	1857..........	146,215	105,091	....	251,306
1828..........	17,261	10,060	61	27.382	1858..........	72.824	50,002	300	123,126
1829..........	11,303	5,112	6 105	22 520	1859..........	69.161	51,640	481	121.282
1830..........	6,439	3,135	13,748	23,322	1860..........	88,477	65,077	86	153,640
1831..........	14,909	7,724	....	22,633	1861..........	54,757	37,066	....	91,823
1832..........	34,596	18,583	....	53,179	1862..........	52,729	39.096	....	91,825
1832..........	4,691	2,512	100	7,303	1863..........	105.801	70,414	....	176,215
1833..........	41,546	17,094	....	58,640	1864..........	114.357	79,055	....	193,412
1834..........	38,795	22,540	4,029	65,365	1865..........	141,275	92,281	15,496	249,052
1835..........	28,196	17 027	151	45,374	1866..........	179.614	111.696	27,181	318.491
1836..........	47,865	27.553	824	76,242	1867..........	179,969	118,389	....	298,358
1837..........	48 837	27,653	2,850	79,340	1868..........	179,436	117,779	....	297.215
1838..........	23,474	13,685	1,755	38,914	1869..........	242,567	153 355	....	395,922
1839..........	42,932	25,125	12	68,069	1870..........	229,269	149.527	....	378,796
1840..........	52,883	31,132	51	84,066	1871..........	217,618	150,171	....	367,789
1841..........	48,082	32,031	176	80,289	1872..........	267,009	182,474	....	449,483
1842..........	62,277	41,907	381	104,565	1873..........	266,865	170.139	....	437,004
1843..........	30,069	22,424	3	52.496	1874..........	171,819	105,774	....	277.593
1844..........	44,431	34,184	....	78,615	1875..........	134,488	74,548	....	209.036
1845..........	65,015	48,115	1,241	114,371	1876..........	120,653	61,374	....	182,027
1846..........	87.777	65,742	897	154,416	1877..........	97,978	51,042	....	1[illegible]9,020
1847..........	136,086	97,917	965	234,968	1878..........	86,259	52,210	....	138,469
1848..........	133,906	92.149	472	226,527					
1819..........	177,232	119,280	512	297,024	Total.....	5,820,066	3,851,926	91,952	9,763,944
1850..........	196,331	112,635	1,038	310,004					

Statement of Number and Nationality of Immigrants arrived in the U. States from October 1, 1819, *to December* 31, 1878.

COUNTRIES.	1820-1830.	1831-1840.	1841-1850.	1851-1860.	1861-1870.	1871-1878.	Aggregate.
England..................................	15,837	7.611	32,092	247,125	213.527	334,600	854 792
Ireland..................................	57,278	198,233	733.434	936,665	774.883	330,958	3,031.451
Scotland.................................	3,181	2,667	3.712	38.331	36,733	65.505	150,128
Wales....................................	170	185	1,261	6.319	4,500	4,717	17,152
Great Britain, not specified	5,362	74,495	277,264	109,653	77,333	7,899	552,006
Total for British Isles..................	81,827	283,191	1.047,763	1,338,093	1,106,976	743,679	4,601,529
Germany..................................	7,729	152,454	434,626	951,667	822,007	577,484	2,945,967
Austria..................................	....	....	....	....	9,398	44,670	54,068
Hungary..................................	....	....	....	....	488	1,186	1,674
Poland...................................	21	369	103	1,164	2.379	10,178	14 216
Russia in Europe	89	277	551	457	2.671	30,816	34,861
Sweden and Norway.........................	94	1,201	13,903	20.931	117,799	129.321	283,249
Denmark..................................	189	1,063	539	3,749	17,885	21,684	45.109
Holland	1,127	1,412	8,251	10,789	9.539	12,263	43 381
France...	8.868	45,575	77,262	76.358	37,749	63,732	309.544
Switzerland..............................	3,257	4,821	4,644	25,011	23.839	19,147	80,719
Belgium..................................	28	22	5.074	4.738	7,416	4,941	22,219
Spain....................................	2,616	2.125	2,209	9.298	6,966	4,358	27,572
Portugal	180	829	550	1,055	2.081	3,755	8,450
Italy....................................	438	2,253	1,870	9,202	12,981	37,961	64,737
Greece	20	49	16	31	82	170	368
Turkey in Europe.........................	21	7	59	83	137	290	597
All other European countries.............	3	40	80	05	11	339	468
Total for Europe other than Great Britain	24,680	212,697	549,739	1,114,567	1,073,431	966,438	3,942,352
Total for Europe.........................	106,507	495,688	1,597,502	2,452,660	2,180,407	1,710,117	8,543,881

Statement of Number and Nationality of Immigrants, etc. — Continued.

COUNTRIES.	1820-1830.	1831-1840.	1841-1850.	1851-1860.	1861-1870.	1871-1878.	Aggregate.
China	3	8	35	41,397	68,059	106,760	216,262
Japan	....	....	....	....	259	84	343
Other countries of Asia	12	40	37	58	130	404	681
Total for Asia	15	48	72	41,455	68,448	107,248	217,286
Cape of Good Hope	2	....	....	....	86	....	88
Liberia	1	8	5	19	31	55	119
Madeira	70	52	3	189	9	17	340
Canary Islands	271	6	1	8	4	28	318
Africa, not specified	14	45	371	204	223	232	1,089
Total for Africa and adjacent islands	358	111	380	420	353	332	1,954
British North America	2,486	13,624	41,723	59,309	167,349	232,650	517,141
Miquelan	....	....	....	....	4	8	12
Total from North America	2,486	13,624	41,723	59,309	167,353	232,658	517,153
Cuba	....	....	....	....	4,240	6,613	10,853
Bermudas	....	....	....	....	63	300	363
Jamaica	....	....	....	....	100	219	319
Bahamas	....	....	....	....	....	2,915	2,915
West Indies, not specified	3,998	12,301	13,528	10,660	5,360	1,310	47,187
Mexico	4,818	6,599	3,271	3,078	2,386	4,177	24,329
Central America	107	44	368	449	96	213	1,277
Total for West Indies, Mexico, and Central America	8,923	18,944	17,167	14,187	12.245	15,747	87,213
U S of Colombia	....	....	....	....	....	156	156
Peru	....	....	....	....	41	100	141
Other states of S. America	542	856	3,579	1,224	1,192	703	8,096
Total for S. America	542	856	3,579	1,224	1,233	- 959	8,393
Australia	2	3	....	104	138	8,410	8,657
Pacific Islands, etc	97	50	359	2,944	3,804	9,414	16,668
Countries not specified	62,894	66,242	82,777	75,911	53,318	22,101	363,243
Total Pacific Islands, etc., and countries not specified	62,993	66,295	83,136	78,959	57,260	39,925	388,568
Born at sea	....	....	....	....	....	496	496
Europe	106,507	459,688	1,597,502	2,452,660	2,180,407	1,746,117	8,542,881
Asia	15	48	72	41,455	68,448	107,248	217,286
Africa	358	111	380	420	353	332	1,984
North America	2,486	13,624	41,723	59 309	167,353	232,658	517,153
W. Indies, Mexico, Central America	8,923	18,944	17,167	14,187	12,245	15,747	87,213
South America	542	856	3,579	1,224	1,233	959	8,393
Pacific, etc	62,993	66,295	83,136	78,959	57,260	39,925	388,568
Born at sea	....	....	....	....	....	496	496
Aggregate	181,824	559,566	1,743,559	2,648,214	2,487,299	2,143,482	9,763,944

Summary Statement of Immigration and Emigration for the Eleven Fiscal Years from 1868 *to* 1878, *inclusive.*

YEAR ENDED JUNE 30.	Total number of Passengers arrived in the U. States.	Total number of Passengers departed from the U. States.	Excess of arrivals over departures, or total increase of population by immigration.	Passengers not Immigrants.			Total aliens, i. e. total arrivals less citizens of the U. States.	Net immigration.	Net emigration.
				Citizens of the U. States returning from abroad.	Aliens not intending to remain in the U. States.	Total non-immigrants.			
1868	328,148	67,335	260,813	40,060	5,899	45,959	288,088	282,189	21,376
1869	389,891	73,862	316,029	26,817	10,306	37,123	363,074	352,768	36,739
1870	436,785	81,886	354,899	33,865	15,717	49,582	402,920	387,203	32,304
1871	386,271	92,547	293,724	43,662	21,259	64,921	342,609	321,350	27,626
1872	472,034	92,904	379,130	49,056	18,172	67,228	422,978	404,806	25,676
1873	520,885	119,154	401,731	47,744	13,338	61,082	473,141	459,803	58,072
1874	375,679	134,686	240,993	47,730	14,610	62,340	327,949	313,339	72,346
1875	295,530	160,786	134,744	50,898	17,134	68,032	244,632	227,498	92,754
1876	237,991	131,618	106,373	48,000	20,005	68,005	189,991	169,986	63,613
1877	206,503	136,549	69,954	41,484	23,162	64,646	165,019	141,857	71,903
1878	199,447	125,533	73,914	41,671	19,307	60,978	157,776	138,469	64,555
Total	3,849,164	1,216,860	2,632,304	470,987	178,909	649,896	3,378,177	3,199,268	566,964
Average number for each year	349,924	110,624	239,300	42,817	16,265	59,082	307,107	290,842	51,542

Emissary, a secret agent; a person sent on a private message or business.

Emollients, a medicinal application which softens, soothes, or allays irritation, and alleviates inflammatory soreness, swelling, and pain. *E.* of honey, gum, sugar, and eggs are among the chief internal articles; and poultices, fomentations, and hot water, the best of the external.

Emoluments, perquisites, fees, or salary; the profits arising from an office or employment.

Empire City, a fire insurance Co. of New York City, organized 1850. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $102,000.07; total cap. and surplus, $302,000.07; risks in force, $9,445,228; premiums, $54,343.03; premiums received since the organization of the Co., $1,955,977.47; losses paid, $803,990.27; cash dividends paid to stockholders, $676,000.

Empiric, a quack, a pretender; an uneducated or irregular practitioner.

Emplette [Fr.], a bargain or purchase.

Employé [Fr.], a clerk; one engaged in the service of another.

Employer, a master; one who hires and directs the labor of others.

Empois [Fr.], potato or wheat starch.

Emporium, in a general sense, signifies a city or a place where extensive commercial transactions are carried on; but it is more particularly applied to the commercial centre of a country, or the place to which buyers and sellers from various countries resort.

Emporium Fire Insurance Co., located in New York City, organized in 1873. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $321.06; total cap. and surplus, $200,321.06; risks in force, $5,234,335; premiums, $29,580.99; premiums received since the organization of the Co., $292,717.72; losses paid, $111,767.30; cash dividends paid to stockholders, $66,000.

Fig. 162. — Emu.

Empress-Cloth, a light cloth for ladies' dresses, all wool, or with cotton warp and wool weft. It is usually 28 inches in width, and resembles merino, except that it is not twilled.

Emptying, a discharging or pouring out the contents of a package or vessel.

Empty Packages, returned cases from the purchaser to the sender of the goods, consisting for the most part of casks, barrels, crates, sacks, etc., which are transported free, or at a very low charge, by the railroad companies. They are admitted free of duty when they have been exported full, and are of American manufacture.

Emu, the Australian ostrich, *Dromaius Novæ Hollandiæ* (Fig. 162). Both the eggs and flesh are esteemed excellent for the table. The plumes are readily dyed of various colors, and appear to some extent in commerce as a substitute for ostrich feathers. The skin produces 6 or 7 quarts of oil, which is used in pharmacy.

Emulsion, a milky preparation formed by the mechanical admixture of oil and water, by means of some other substance that possesses the power of combining with both.

In the preparation of *E.* the oily or resinous ingredients are usually suspended by means of mucilage of gum arabic, almonds, or yolk of egg. 1 dr. of the first, made with equal parts of gum and water; 1 oz. of the second (usually 26 in number); and one in number of the last, will form 2 dr. of any oil into an *E.* with about 1 oz. of water, gradually added. In some cases, instead of the above substances, a little liquor of potassa is employed, by which a saponaceous *E.* is formed. In all cases the mucilage or other viscid substance should be put into the mortar before anything else. The oil or resinous matter may then be very gradually rubbed in, taking care not to add it more quickly than it can be subdued by the pestle; and if, during this part of the manipulation, the mixture should begin to assume a breaking or curdling appearance at the edges, a few drops of water must be immediately incorporated with it, before adding the remainder of the oil. From the want of this precaution, it is common for an *E.* suddenly to lose its tenacious consistence in the mortar, and it is then in vain to endeavor to restore it. After the oil is thoroughly incorporated some care is requisite to avoid separating it again by too hasty an effusion of the water or other fluid of the mixture. If any alcoholic or acid liquid is to be added, it must be at the very end of the process. Indeed, the addition of an acid liquid, even a slightly acescent sirup, will often entirely destroy an emulsion. An excellent method of preparing *E.* of resins and gum-resins is to put the article into a marble or wedgewood mortar, and to pour over it about 4 times its weight of rectified spirit, which is then to be ignited, and the mixture triturated until an equal consistence is obtained. The liquid is then to be added gradually, and the whole patiently triturated or shaken until cold. Yolk of egg or mucilage may be added to the fluid resin or gum-resin, if desired, as in the common method, but an excellent *E.* may be made without them. The presence of soluble salts in an *E.* is apt to occasion the separation of the oleaginous portion. Spirit produces the same effect in those which are made with yolk or mucilage; and acids in those made with an alkali. The addition of these substances to *E.* should be therefore avoided as much as possible. *E.* of wax, spermaceti, oil of turpentine, and balsam of copaiba, are the most readily and completely formed with yolk of egg. Volatile oils are more readily made into *E.* if mixed with an equal volume of some simple fixed oil, before proceeding to operate on them. Scammony is generally formed into an *E.* with milk; and resin of jalap, with almonds and water.

Enactment, the passing of a bill into a law; the act of voting, decreeing, and giving validity to a law.

Enamel [Fr. *émail*; Ger. *schmelz*; It. *smalto*], a species of vitreous varnish, colored with metallic oxides, applied in a thin stratum to brightly polished metallic surfaces (copper or gold), on which it is fused by the flame of a lamp urged by the blowpipe, or by the heat of a small furnace. The basis of all *E.* is a highly transparent and fusible glass, called *frit*, *flux*, or *paste*, which readily receives a color on the addition of metallic oxides. There is no difference between an *E.* and a glaze, save in the character of the surface to which it is applied. Both are vitrified substances, either with or without color, and exhibiting every degree of translucency, — some varieties being perfectly transparent, while others are completely opaque. Chemically they consist of easily fusible salts, such as the silicates and borates of sodium, potassium, and lead, to which various metallic oxides are added when it is desired to impart color to the *E.* These varieties of glass are pulverized, and the powder is used either in a dry or, more commonly, in a moistened state. The powder or paste, having been spread over the surface to be

incrusted, is exposed to a moderate temperature in a muffle heated in the *E.*-furnace, when the vitreous substance soon becomes sufficiently fluid to spread itself over the metallic surface, to which it closely adheres. If the glass is merely cemented to the metal, without any trace of fusion, the process is not true enamelling. Popularly the term *E.* has a much wider use, being applied, in fact, to almost any brilliant surface, whether produced by varnishing, by lacquering, or by other processes not involving fusion; hence we hear of enamelled leather, enamelled paper, enamelled slate, etc. Sometimes a coating of true *E.* or of glaze is employed solely for utility, as in the case of vessels of enamelled iron or of glazed earthenware; but more commonly *E.* are applied with a view to decorative effect, the decoration thus produced being extremely permanent, since the fused material is but little affected by atmospheric influences. When enamelling is thus artistically employed, it is usual to speak of the finished works of art themselves as *enamels* (Fr. *émaux*).

In order to prepare a plate for the artist, a thin piece of gold or of copper is carefully annealed, and then coated with a dead white *E.* The *E.* is imported in cakes from Venice, and is made from a mixture of silica, borax, and stannic oxide. After the plate has been fired, a second coating of *E.* is applied, and the plate returned to the oven. It is afterwards coated for the third time, but now with a more easily fusible glass, which is known in the workshop as "flux." This is also imported from Venice, in the form of tubes and beads, and is employed to produce a brilliant lustre on the surface. The ground having been thus prepared is carefully ground smooth, and is then ready for the artist. The colors which he employs consist of various metallic oxides mixed with the flux; but it is obvious that the enameller's palette must be limited, since he is able to employ only such substances as are permanent at the temperature to which the plate will be subjected in the muffle. Blue colors are produced by means of oxide of cobalt; violet by oxide of manganese; green by cupric oxide or by chromic oxide; red either by cuprous oxide, which is difficult to work in the oven, or by the preparation of gold known as purple of Cassius, which also produces a fine purple; yellow by oxide of silver, oxide of lead, or an alkaline antimoniate; brown by ferric oxide; and black by ferrous oxide, or by means of cobalt and manganese, which have intense tinctorial power, and produce dense colors. Special recipes will be found in technical treatises, and need not be inserted here. The powdered colors of the enameller are mixed with oil of lavender or spike and spirit of turpentine, as a vehicle, and are applied to the *E.*-ground by means of a camel's-hair pencil. After each layer has been spread over the surface the plate must be fired, and highly finished work may have to pass through the oven a score of times. Once vitrified, the colors are permanent; hence the artist has no opportunity of correcting faults, except by the tedious process of grinding away a portion of the plate. Since the tints may be greatly modified by too high a temperature, the greatest care is needed in managing the furnace. In return for the great labor and risk involved in enamelling, the artist secures permanence for his work, the painting being always as fresh as when first executed; it is indeed a painting in glass

To whatever period the origin of enamelling may be assigned, it is certain that glazes having the composition of good *E.* were manufactured at a very early date. Excellent glazes, composed about as modern *E.*, are still preserved on some of the bricks which have been found among the ruins of Babylonia and Assyria, and have been referred to the 8th or 7th century B. C. Enamelling was probably practised at a very early period in Western Europe, but it is in the Eastern empire that we find the earliest historic evidence of the art having flourished as an important industry. Byzantium was indeed for centuries the great seat of this industry, which probably dated from at least the time of Justinian. The word "smaltum" is found for the first time in a life of Leo IV. written in the 9th century. Theophilus, the artist-monk, has left a minute description of the manner in which the Byzantine enamellers of the 10th century carried on their work. Most of the Byzantine *E.* were executed on plates of gold, and large numbers have no doubt been destroyed on account of the intrinsic value of the metal. Such specimens as are extant furnish valuable examples of what is known as the *cloisonné* process. In cloisonné work, the design is presented in colored *E.*, which are separated one from another by means of ribs of metal bent so as to follow the outline of the subject. A plate of gold generally formed the basement of the work, and upon this plate the design was traced in slender fillets of gold. These threads were easily bent to the required form, and were fixed upright upon the plaque, so as to form a number of cells for reception of the *E.* The powdered glass, moistened into a paste, was carefully introduced into these compartments, and the prepared plate was then fired. To retain the fused *E.*, the edges of the plates were slightly turned up, thus forming a rim. After careful cooling, the irregular fused surface was ground down and polished, when the design appeared in colored *E.* separated by gold partitions, or *cloisons*. In many cases the metal base forms part of the field, and the subject is then enamelled in a hollow which has been beaten out, while the gold forms a brilliant background. Cloisonné enamelling has been employed by the Chinese and Japanese, who, instead of restricting it to flat surfaces of the precious metals, have applied it to copper vases and other large hollow vessels. They also ingeniously attach the metal fillets to the surface of pottery, and thus produce cups, vases, and other objects in porcelain ornamented with cloisonné work. Many Chinese and Japanese *E.* are, however, executed by other processes, such as the champ-levé method, to be afterwards described. — A rare variety of cloisonné enamelling is known to French antiquaries as *E. de plique à jour*. The peculiarity of this style consisted in setting transparent *E.* without any background, so that light could be freely transmitted through the glass, the *E.* being fixed by having their edges fused to the windows in which they were framed. Specimens of this work are extremely rare. — Very similar in effect to the cloisonné *E.*, but much less rare and valuable, are those inlaid works which were executed by the *champ-levé* process. Copper was usually employed in place of the precious metals; and the partitions between one color and another were formed by ridges of the base, and not by separate fillets of metal. A plate of copper, about ¼ inch thick, and having the surface polished, formed the groundwork of the *E.* By means of a graver, the parts to be enamelled were chased out, so as to leave slender ribs standing up as boundary walls to the cavities. *E.* in the state of either powder or paste was then introduced into these casements, and the work was fired. Finally, the surface was polished, and the metallic outlines generally gilt. In some examples, the figures are represented in *E.* on a metal background; while in others the figures stand out in engraved metal upon an enamelled background; and in others again the entire field is enamelled. — Soon after the introduction of transparent enamelling in Italy, the art became popular in France, and this probably led the way to the invention of *enamel-painting*. The artists of Limoges acquired great celebrity in this work. The early painted *E.* from the Limousin workshops were executed in opaque white upon a brown ground, the white being overlaid where necessary by transparent colored enamels. The lights were picked out in gold, while the brilliant effect of gems was obtained by the use of *paillettes*, or colored foils. Nardon Penicaud is the best-

known artist in this style, and an excellent example of his work, dated 1503, is preserved in the Hôtel de Cluny in Paris. About the beginning of the 16th century a much more finished style of painting was introduced at Limoges; and under the auspices of Francis I. the art attained to a considerable development. Léonard Limousin, who is known to have painted from 1532 to 1574, became the great master of this style. While some of the works were executed in brilliant colors, most of them were in monochrome. The background was generally dark, either black or deep purple, and the design was painted *en grisaille*, relieved in the case of figure-subjects by delicate carnations. The effect was occasionally heightened by appropriate touches of gold, and in many of the colored *E.* brilliancy was obtained by the use of silver foil, or *paillon*, placed beneath a transparent *E.* Portraits were frequently painted on copper plaques; and the art was also applied to the decoration of ewers, vases, plateaux, candlesticks, salt-cellars, and a variety of elegant objects for domestic as well as ecclesiastical use. Among the artists of this school may be mentioned Pierre Raymond, Jean Pénicaud, Pierre and Jean Courtois, Martin Didier, Jean Court dit Vigier, P. Courteys, and the master known only by his initials C. N. Towards the latter end of the 16th and in the beginning of the 17th century it was the fashion for the Limoges enamellers to paint in a minute style, which is seen in the works of the brothers Laudin and of the family of Nouailhers. The art at length degenerated into a system of tawdry coloring, and in the reign of Louis XIV. it fell into a state of decay, from which an attempt to revive it was made by Louis XVI., but without success. — Probably the decline of the Limoges school was connected with the rise of a new branch of enamelling, which has been distinguished as the *miniature style*. This is the style which has continued in vogue up to the present day. — In the middle of the last century the art of enamelling was largely applied to the decoration of snuff-boxes, patch-boxes, tea-canisters, candlesticks, needle-cases, labels for wine-bottles, and a variety of other small articles. The objects were usually made of copper, and having been coated with an opaque white *E.*, were decorated with Watteau subjects and floral and other designs, painted in enamel colors. Advantage was also taken of the process of transferring engravings from copper plates to glazed surfaces, — a process which was introduced about the year 1750 by Sadler and Green of Liverpool, and was largely employed for the decoration of pottery and porcelain. Splendid snuff-boxes and other ornamental articles in enamelled work were also turned out by artists in France and Germany.

Enamelling of cast-iron. The art of enamelling has been of late years extensively applied to the coating of iron vessels for domestic purposes, with the view of keeping a clean surface and preventing the rusting of the metal, and within the last forty years a large number of patents have been granted for similar purposes. One of the most extensively used processes is that of Charles Henry Paris, which is now largely worked at Birmingham. The metal articles are first cleaned with dilute sulphuric acid, and powdered glaze is then sifted upon the clean surface. Adhesion of the powder is secured by applying to the iron a coating of gum-water. The object is then dried in an oven, whence it is transferred to the enamelling-furnace, where it is heated until the fused glaze flows evenly over the surface. After removal from the oven, the objects are allowed to cool with extreme slowness. It is often found necessary to apply a second coating of *E.* Paris's composition consists of 130 parts of cullet or broken glass, 20½ parts of carbonate of sodium, and 12 parts of boracic acid. This forms the fundamental glaze, upon which variously colored *E.* may be employed. If enamelled vessels are to be used for culinary purposes, great care must be taken that the glass contains no lead, the presence of which would be highly dangerous. Acids often find their way through the pores of an *E.* to the subjacent metal, and spreading out between the iron and the glaze cause the *E.* to peel off. Exposure to sudden changes of temperature also tends to injure the *E.* — Enamelling of a similar character is now largely used for street plates, name-plates at railroad stations, advertising tablets, and other objects where permanent lettering is required. The insides of baths, cisterns, and boilers are also protected by enamelling, and it has been proposed to prevent the fouling of ships' bottoms by a coating of *E.* *Imp.* duty, *E.* of glass and oxide of iron, 40 per cent.

Enamelled Cards, pieces of pasteboard, one surface of which has been coated with white lead and size, and then glazed by passing between highly polished rollers.

Enamelled Leather, glazed leather for patent boots and shoes, belts, etc., by means of sumach. The gloss, or enamel, is given by successive coats of linseed oil, and finally of a varnish of copal and asphaltum. See LEATHER.

Enamel-Painting. See ENAMEL.

Enamel Ware, iron cooking utensils, the interior surfaces of which are enamelled. See ENAMEL.

Encaustic, an ancient method of painting, in which the pictures were executed with wax colors, and finished by the application of a hot iron. The term is now very generally applied to all kinds of painting, where the colors are laid on or fixed by heat, so as to be rendered permanent and brilliant.

Encaustic Tile, a variegated paving-tile, on which patterns have been formed in colored clays on the ordinary buff-tile, and fired, which brings out the colors more vividly. This art appears to have had its origin in the latter part of the 12th century, but the culminating point of its excellence and popularity was attained during the 13th; and it was extensively used for the decoration of Gothic buildings in connection with each succeeding change in that style of architecture. The modern revival of the art dates from the year 1830, when a patent was granted to Samuel Wright, an English potter, who sold his patent-right, in 1844, in equal shares, to the celebrated china manufacturer, Herbert Minton, and Mr. Fleming St. John. *E. T.* have been since largely manufactured at Stoke-upon-Trent, and at Benthall, near Brosely, Shropshire, England. The modern application of *E. T.* is by no means confined to the ecclesiastical purposes for which they were mainly used in mediæval times, although for this purpose many of the ancient designs have been reproduced, and the rough execution of the old examples has been imitated with striking fidelity. Some of the most eminent architects of recent years have exercised their skill in the production of designs more suitable for domestic purposes; and pavements of these tiles, combined with other kindred manufactures, have become an almost universal part of the permanent decoration of the better class of public and private buildings,

for which purpose they are largely imported into this country, already partly superseding the perishable forms of flooring, and at the same time rendering unnecessary any decorative coverings. *Imp.* duty, 35 per cent. See MOSAIC and TILE.

The manuf of *E. T* may be described under two heads,—viz., the *plastic* and the *semi-dry* or *dust* processes. The former, which was the only one employed up to the year 1863, is in every essential point the same as that used in mediæval times, differing merely in the greater finish and perfection which modern appliances have effected, and probably also in the material of the moulds. It is not known of what those anciently used were made, but conjecture has suggested wood, fired clay, and stone. The great difficulty of the manuf consists in the necessity for introducing into a single tile the variety of different colored clays or *bodies* which together compose the design, it being essential that they should not only be perfected by the same amount of heat in the process of firing, but that they should possess an equal contractile power during each stage of the manufacture. The tile is first impressed from a plaster of Paris mould, bearing the pattern in relief, and set in a brass frame, upon which fits another frame, the dimensions and depth of which correspond with the size and thickness of the tile, the pattern is thus sunk in the clay to a depth of about one sixteenth of an inch, in the following manner. The workman first introduces into the mould what may be described as a sheet of refined clay of the desired color for the ground of the pattern; upon this facing, which forms a kind of veneer, is placed a thicker mass of a coarser kind of clay, and the whole is then subjected to screw pressure, which consolidates the two kinds of clays, and at the same time perfectly impresses the pattern of the mould; the superfluous clay is then removed with a scraper, and a second veneering of fine clay, similar to that used for the face, is placed on the back; the tile being removed from the mould, the depressed parts of the design are filled with clay, of one or more colors, by pouring it in in a *slip* or semi-liquid state. The tile is then set aside for twenty-four hours to stiffen, and when the slip inlay has become nearly of the same consistency as the tile itself, the face is brought roughly to an even surface, by "spreading" the soft clay with a palette-knife. The tile is then further allowed to dry till it attains the stiffness of wax, when it is "finished" by scraping the face with a steel scraper, until the inlaid pattern and ground are developed free from superfluous clay, and the edges are cut true to a square, when it is ready for the drying-stove. When the drying, which takes from six to ten days, is completed, the tiles are placed in fire-clay boxes, known as *saggers*, containing from eight to ten each, which are then stacked, one upon another, in the kiln or oven. The process of firing occupies four days and nights, and has to be conducted with the greatest care, as not only the exact size and hardness of the tiles are dependent upon it, but also the perfection of the colors, with which object it is necessary to raise the heat very gradually, and to secure a regular circulation of air in the oven, so as to produce the exact degree of oxidization needed to bring out the desired colors in the materials used for this purpose. The pyrometers used in this part of the process consist of long narrow tiles, and the degree of heat is judged both by their color and the gradual reduction in length which they undergo, each piece, as it is withdrawn from the oven, being measured in a gauge, with this object,—the total shrinkage of the tile, in the drying and firing, amounting to about 1¼ inches in the foot. For purposes of paving, most of the modern *E. T.* are used in the *bisque* or unglazed state, the glaze in the ancient tiles having apparently been employed with the object of covering the soft material of the tile itself, and of adding richness to the color. Where glazing is found necessary in the modern tiles it is effected by dipping them in a combination of lead, alkaline salts, felspar, and silica, finely levigated in water, which is fused by passing them through a kiln specially constructed for the purpose.

The *semi-dry* or *dust* process of manuf. *E. T.* is an adaptation of an invention patented in the year 1840 by Richard Prosser, by which articles of various kinds are moulded out of *pulverized clay*, in metal dies, by screw pressure. In the year 1863 Messrs. Boulton and Worthington, engineers of Burslem, patented a process by which the use of powdered clay (hitherto only used for tiles of one color) was applied to the manuf of *E. T*. The design is formed by perforated brass plates,—from one to six or seven being used according to the nature of the pattern. Where the whole design can be perforated in the plate without detaching such parts as would represent the ground, only one plate is needed; but where there are several concentric rings or similar forms, additional plates are required. Into the perforations of each plate metal rams, attached to a flat plate of iron, are accurately fitted. The metal die in which the tiles are pressed is composed of a thick block and a square frame or "box", the latter is connected with levers and a balance-weight, so that it can be raised or depressed, either forming a hollow mould, of which the face of the block above mentioned forms the bottom, or depressed in such a way as to leave the face of the block standing above it, in which latter position it is ready for the commencement of the process. The perforated plates first mentioned are then, in succession, placed upon the face of the block, being kept in position by two pins fixed to the frame of the die, corresponding with holes made in their margin. The perforations of the brass plate being filled with powdered clay of the desired color, this is so far compressed, by means of the metal ram, as to allow both the ram and the plate to be removed together, leaving the compressed dust (representing the pattern of the tile in relief) on the block or face plate. In cases where a number of plates are necessary, the pattern is thus *built up*, each adding such a part as can be perforated in a single plate. The frame is then raised, so as to form a mould of the required depth, which being filled with powdered clay, intended to form both the ground of the pattern and the substance of the tile, the whole mould or die is slid, in a groove provided for the purpose, under the screw press, to which is attached a plate covering the mould, and resting on the top of the movable frame; this, on pressure being applied, forces down the frame until the powdered clay is thoroughly consolidated and incorporated with that part forming the design. On the pressure being relieved, the die is drawn from beneath the press, the frame is forced down by means of the levers to which it is attached, and the tile is left resting face downwards on the block, when it is ready for the drying-stove, the subsequent treatment being the same as in the plastic process. This process affords the advantage of much greater rapidity in execution than can be effected by the plastic method, and as the tile undergoes little or no shrinkage in the desiccation of the small amount of moisture which is needed to make the particles of the dust combine under pressure, the risk of distortion in the process of drying is reduced to a minimum, but the heavy prime cost of the perforated brass plates necessarily confines this otherwise valuable invention to such designs as are most largely in demand.

Enchasing. See CHASING.

Enchère [Fr.], an auction; an outbidding.

Enclosure, land fenced in or hedged round for separation or for the protection of crops.

Encre, the French word for printing or writing ink.

Encyclopædia, a dictionary or descriptive work of reference, which treats of the various branches of the arts, sciences, and manufactures.

Endasse, Endraze, names for the short ell or pike in Turkey, by which cotton goods and carpets are measured; it is equal to 27.06 inches.

Endive, a hardy annual herbaceous plant, the *Cichorium endivia*, the blanched leaves of which are used as a salad.

Endless Screw. See SCREW.

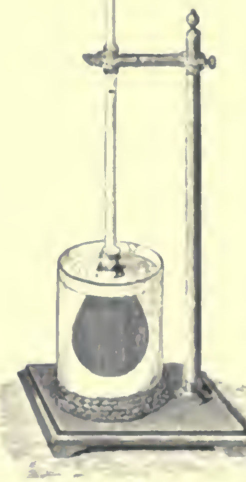


Fig. 163 — ENDOSMOMETER.

Endorsement. See INDORSEMENT.

Endosmometer. When two different liquids are separated by a thin porous partition, either

inorganic or organic, a current sets in from each liquid to the other; to these currents the names *endosmose* and *exosmose* are respectively given. These terms, which signify *impulse from within*, and *impulse from without*, were first introduced by M. Dutrochet, who first drew attention to these phenomena. They may be well illustrated by means of the *endosmometer*. This consists of a long tube, at the end of which a membranous bag is firmly bound (Fig. 163). The bag is then filled with a strong sirup, or some other solution denser than water, such as milk or albumen, and is immersed in water. The liquid is found gradually to rise in the tube, to a height which may attain several inches; at the same time the level of the liquid in which the endosmometer is immersed becomes lower. It follows, therefore, that some of the external liquid has passed through the membrane and has mixed with the internal liquid. This phenomenon is due to the attraction which the two liquids have for each other and for the diaphragm separating them, and advantage is taken of it in many operations of the chemist.

Endowment, in life insurance, is a term applied to the assurance of a capital sum or survivorship of time.

Enema, a medicine, usually liquid, but sometimes gaseous, thrown into the rectum or lower bowels; a clyster.

Enflurage. See POMADE.

Engagement, an obligation, contract, or undertaking entered into.

Engine, the general name for any mechanical machine which produces or regulates motive-power, such as fire-*E*., steam-*E*., etc. An *E*. acts automatically, so differing from an ordinary *machine*, whose motor is distinct from the operator, and from a *tool*, which is propelled and operated by one person. *E*. are of three great classes, locomotive, marine, and stationary, and in their motion are either oscillating or rotary.

Engineer, one skilled in mechanism, or the construction or management of complicated machinery, and the uses of motive-power, repairs of mill-work, etc. See ENGINE-MAN, and ENGINEERING.

Engineering, the art of designing and constructing works, embraces a very wide range of subjects, and the different departments into which the profession is now divided do not admit of very strict definition; but it may be mentioned that *civil E*. includes the design and construction of canals, river navigation, harbors, docks, roads, bridges, railroads, lighthouses, water-supply, irrigation, sewerage, gas-supply, telegraphs, etc.; *mechanical E*. includes machinery, mill-work, steam-engines, iron ship-building, agricultural implements, etc.; *mining E*. includes the working and raising of coal, iron, lead, copper, and other minerals; and *military E*. includes fortifications, gunnery, artillery, telegraphy, etc., as applied to warfare.

Engine-Man, a machine-man; one who attends to the engine in a locomotive, steamboat, mill, etc. He is often loosely called an engineer.

England. See GREAT BRITAIN.

Engrais, the French word for manure.

English, in printing, a size of type between great primer and pica.

English Channel [Fr. *La Manche*, the sleeve], is that part of the Atlantic Ocean which lies between the N. W. coast of France and the S. coast of England. Its eastern extremity is connected with the German Ocean by the Strait of Calais, 21 m. wide, and on the west it is imperceptibly confounded with the Atlantic Ocean. It lies between lat. 38° 48′ and 51° north, and long. 1° 20′ east and 5° 43′ west. At its termination — on a line drawn from Land's End to the extreme easterly point of the department of Finisterre in France — it is about 100 m. wide. On the French coast it forms three considerable bays; the most easterly receives the Severne; the second receives the Seine and several smaller rivers; the third and largest lies on the S. W. of the peninsula of Cotentin. On the English coast is Mount Bay, between Lizard Point and Land's End. Between Lizard Point and Start Point is a large gulf, on which are situated Talmouth and Plymouth; the Gulf of Exeter lies to the E. of Start Point. The principal islands in the English Channel are, the Isle of Wight, on the English coast, and the Norman Islands, lying on the French coast, the principal of which are Guernsey and Jersey. The prevailing winds are from the west. The channel, being shallow and confined, is subject, from its communication with the Atlantic, to high and impetuous tides. The channel has a current that sets from the westward, and is noted for its disagreeable roughness. Portions of the channel are of dangerous navigation, but chiefly near the shores.

Engraving is the art of producing by incision or corrosion designs upon blocks of wood, plates of metal, or other materials, from which impressions or prints upon paper or other soft substances are obtained by pressure. There are several varieties of *E*., the chief of which are: 1. *Line E*. on metal plates, usually of copper or steel, in which the line is always incised; 2. Etching, usually on metal, in which the lines are corroded by means of acid; 3. Mezzotint, in which there are no lines whatever, but only shades produced by roughening the surface of the metal; 4. Woodcut, in which the lines which print black have to be left in relief, while the surface round them is cut away. These primary technical conditions have an irresistible influence even upon the mental qualities exhibited in the different kinds of *E*. Each kind is favorable to certain mental states, and unfavorable to others, each being in itself an artistic as well as a technical discipline. A line *E*. will not see or think like an etcher, nor an etcher like an *E*. in mezzotint; and the consequence of this difference is that the manner in which a line has been cut has a great influence in determining the direction of artistic taste and feeling. Nor is that influence confined to the engravers themselves. The enormous multiplication of their work by printing makes engravers only second to writers in their power over public taste, which they can refine or vitiate by spreading refined or vulgar interpretations of pictures. The several varieties of *E*. are given in this work under the headings COPPER-PLATE ENGRAVING, ETCHING, LITHOGRAPHY, MEZZOTINT, NIELLO, WOOD-ENGRAVING, etc.

Engravings, impressions taken on paper from engraved steel or copper plates; in trade, lithographic prints are generally classed with engravings. *Imp*. duty, bound or unbound, in black or colored, 25 per cent.

To clean E. Place the *E*. on a smooth board, and cover it thinly with finely powdered and very clean common salt. Next squeeze lemon juice upon the salt so as to dissolve a considerable portion of it. Now elevate one end of the board so that it may form an angle of about forty-five or fifty degrees. Next pour on the *E*. boiling water from a tea-kettle until all the salt and lemon-juice are washed off. The *E*. will then be found to be perfectly clean and free from stains. Care must be taken to dry it on the board or on some smooth surface

very gradually. It will acquire a yellow tint if dried by the sun or before a fire.

To mount E. Strain thin calico on a frame, then carefully paste on it the *E.*, so as to be free from creases; afterwards, and when dry, give the *E.* two coats of thin size (made by putting a piece of glue the size of a small nut into a small cupful of hot water); finally, when this dries, varnish the *E.* with a varnish known as "white hard."

Engrossing, the art of making a fair copy of a draught in a bold plain hand. — The purchasing of large quantities of any commodity, in order to sell it again at a high price.

Enrichment, the builder's name for the figuring or moulding of a cornice.

Enrolment of Vessels. See COASTING-TRADE.

Ensign, a banner usually suspended over the poop or stern of a ship, to distinguish vessels of different nations.

Enter, to register; to set down in writing.— To lodge a manifest and make entry of goods at the custom-house.

Enterprise, a projected scheme; a hazardous adventure.

Entertainment, a public dinner; amusement of any kind, a concert, dancing-room, etc.

Entire, the name for a kind of beer, combining the appreciated properties of two or three esteemed qualities of malted beverage. — A stallion or ungelded horse.

Entr'acte [Fr.], the time between the acts of a play; an interlude.

Entrée, an admission or introduction. — The first course of dishes.

Entrelacs [Fr.], threads, twine, or string.

Entremets, side-dishes; dainties.

Entreposer [Fr.], to store or warehouse goods.

Entrepot, a mart; a store-room for the deposit of goods; a bonded warehouse.

Entrepreneur, a French contractor; one who executes or undertakes constructive works.

Entresol [Fr.], a suite of rooms between two floors; a low apartment, usually placed above the ground-floor.

Entry, the record made in a merchant's books of any business transacting. See BOOK-KEEPING. — The lodgment of a ship's papers in the custom-house on arrival, when permission to land cargo is obtained. See IMPORTATION.

Enumerator, a calculator; one employed to count over or reckon up figures or things.

Envelope, the outer cover or enclosure case for a letter; the wrapper on which the address is written.

E. machine. It was at the London Exhibition of 1851 that the public first became generally acquainted with the beautiful machines for making *E.* Since that time such machines have been constantly in use, bringing down the price of *E.* in a wonderful degree, and yet leaving a large amount to be executed by hand-making. Nearly all the processes are automatic in Hill and Delarue's apparatus. The paper is cut into blanks; the seal flap is stamped with some kind of device by a die; a plunger in a box makes four creases in every blank; two flaps are folded down by two levers; gum is applied to each flap edge; a lever folds down a third flap on these two edges, to which it is instantly cemented; another lever folds down the fourth flap, but without cementing it; and then a pusher drives away the finished *E.* to make room for another. All these processes succeed one another with such beautiful regularity that the *E.* are precisely alike (until a *purposed* change is made in form, size, or pattern); and with such rapidity that an *E.* is completely made in less than a second, or about 4,000 per hour by one machine. The Rémond's, Robineau and Roumestant's, and Keating's, are also well-known *E.* machines.

Eosine, a recently discovered aniline red color resembling cochineal in its qualities. See DYEING (*aniline reds upon wool*).

Epaisseur [Fr.], thickness; density.

Epaulet, an ornamental badge, worn on the shoulder of military men. The *E.* of commissioned officers are usually of gold, while those worn by non-commissioned officers, etc., are of brass, worsted, etc.

Epaves [Fr.], goods found floating at sea without owner; flotson and jetson.

Epergne, an ornamental stand for a large dish on a table.

Epicerie [Fr.], grocery wares, spices, etc.

Epidemic, common to many people. An epidemic disease (*epidemic; epidemy*) is one which seizes a number of people at the same time and in the same place, but which is not dependent on any local cause, but on some extraordinary condition of the air. When a disease is peculiar to a people or nation, and appears to depend on local causes, it is said to be *endemic*. Thus, Asiatic cholera may be taken as an example of the first, and the agues of low countries as examples of the other.

Epingle [Fr.], a pin; any small pointed instrument.

Epitome, an abstract, abridgment, or compendium.

Epizoötic Diseases are diseases which attack different species of domestic animals in the same manner that epidemics do man. These maladies ravage large tracts of country, frequently causing great mortality amongst the various animals inhabiting the localities visited by them; different animals being assailed by different forms of *E. D.* For instance, there is the rinderpest, or plague peculiar to cattle; the typhoid or gastric fever of horses; the small-pox of sheep; the diphtheria, affecting oxen, sheep, goats, and pigs; the influenza of horses; and the charbon of pigs. Dogs, cats, tame and wild birds, fish, silk-worms and bees, each suffer from a special variety of *E. D.*

Eprouvette, a French instrument for testing the strength of gunpowder.

Epsom-Salts, or **Epsoms**, the sulphate of magnesia, a salt, when pure, usually found in colorless acicular crystals derived from the right rhombic prism, and containing 51.22 per cent of water of crystallization. It is somewhat efflorescent, for at 32° F. water will dissolve over one fourth its weight of the anhydrous salt, and as the temperature is raised the solubility increases. The salt was formerly manufactured from the waters of the mineral spring of Epsom, England. It also exists largely in sea-water, from which it was formerly prepared in large quantities. In Italy it is now prepared from a schistose rock; in England, from dolomite; in Pennsylvania and Maryland, from magnesite. This salt is used in medicine as a cooling and generally safe cathartic. It is nauseous to the taste, but may be easily taken in "soda-water" with lemon sirup. In the household it is an excellent addition to starch, decidedly increasing its stiffening powers. Mixed with ordinary whitewash, it gives a fine pearly whiteness to walls. It is largely used for weighting cotton cloth. As a manure it has been chiefly employed as a top-dressing for clover hay.

Equation of Payments. When several sums of money due at different times are owing from one person to another, it is sometimes required to find the time when they may be all discharged in one payment without injury to either party: this is called *equating the payments*; and the principle of the rule consists in finding the time when the interest of the sums which are deferred till after they are due is equal to the discount of those which are paid before they are due.

1. Reckoning Simple Interest.

Rule. — Multiply each sum by the time when it is due, then divide the sum of these products by the total debt; the quotient is the time at which all the money ought to be paid.

Example. — A sum of $300 is due on 2d March, $350 on 18th March, and $525 on 17th April; required an average time for the payment of them all in one sum.

The number of days from the 2d to the 18th of March is 16; and from the 2d March to the 17th April, 46; hence,

$$\begin{array}{rl} 300 \times 0 = & 0 \\ 350 \times 16 = & 5,600 \\ 525 \times 46 = & 24,150 \\ \hline 1,175 \quad . \quad . &)29,750(25 \text{ days from March 2d, or March 27th nearly.} \end{array}$$

The distance of time is calculated from the 2d March, because, the first sum becoming due on that day, there is no discount to calculate upon it.

2. Reckoning Compound Interest.

Rule. — From the logarithm of the sum of all the debts subtract the logarithm of the sum of the present values of such debts, and divide the remainder by the logarithm of the amount of £1 in a year, at the given rate of interest: the quotient will be the equated time required.

Example. — Suppose A were indebted to B in the sum of $750, which was to be paid in three instalments; namely, $250 at the end of 1½ years, $100 at the end of 2 years, and the remaining $400 at the end of 4 years; in what time, reckoning compound interest at 6 per cent, ought the whole to be discharged in one payment?

Here we have the sum of all the debts = 750, and the sum of their present value = 634.913963 (See Interest and Annuities.) Consequently,

$$\frac{\text{Log. } 750 - \text{Log. } 634.913963}{\text{Log. } 1.06} = \frac{.723463}{.0253059} = 2.85887, \text{ or 2 years and 313 days}$$

Equations (Rule of). See Chain-Rule.

Equator, a great circle of the sphere, equally distant from the two poles of the world, or having the same poles as the world. It is called *E.* because when the sun is in it the days and nights are equal; whence also it is denominated the *equinoctial;* and when drawn on maps, planispheres, or globes, it is called the *equinoctial line*, or simply *the line*. Every point in the equator is 90 degrees, or a quadrant's distance, from the poles of the world, and hence the equator divides the sphere into two equal hemispheres, in one of which is the northern, and in the other the southern pole. Terrestrial longitudes are measured on the equator or some one of its parallel circles; commencing from some arbitrary point, which different nations assume variously, most of them adopting the meridian which passes through their capital city or principal observatory. Latitudes are counted from the equator along the meridian.

Equatorial, an astronomical instrument with a telescope, for taking celestial observations.

Equestrian Statue is a statue representing a person mounted on horseback.

Equinox is the time at which the sun passes through the equator in one of the equinoctial points. When the sun is in the equator, the days and nights are of equal length all over the world, whence the derivation of the term. This happens twice every year, namely, about the 21st of March and the 22d of September; the former is called the *vernal*, and the latter the *autumnal* equinox. The equinoxes do not divide the year into portions of equal length; for in consequence of the sun being at his greatest distance from the earth during the summer months, and his angular motion in his orbit being consequently slower, the interval from the vernal to the autumnal equinox is greater than that from the autumnal to the vernal. In other words, the sun continues longer on the northern than on the southern side of the equator. At the beginning of the present century the difference amounted to 7 days 16 hours and 51 minutes. The summer in the northern hemisphere is constantly longer than in the southern by this quantity; and to this circumstance some meteorologists ascribe, in part at least, the higher temperature that is found to prevail in the northern hemisphere under the same parallel of latitude.

Equipage, the furniture of an army or body of troops. In this sense it includes arms, artillery, utensils, provisions, etc. Camp *E.* includes tents and things necessary for accommodation in camp; while field *E.* consists of arms, artillery, wagons, tumbrels, etc. — *E.* is also often applied in Europe to a vehicle or carriage of state.

Equipments, the clothing, accoutrements, arms, etc., of a soldier; hence there are artillery *E.* for field and garrison, and engineer *E.*, etc.; also the fitting out of a ship for sea.

Equitable Fire and Marine Insurance Co., located in Providence, R. I., organized in 1859. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $67,138.61; total cap. and surplus, $267,138.61; risks in force, $9,025,880; premiums, $102,693.81; premiums received since the organization of the Co., $1,503,855.71; losses paid, $1,145,038.85; cash dividends paid to stockholders, $274,000.

Equitable Life Insurance Society of the U. S., located in New York City, and organized in 1859. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $100,000; total net assets, $35,015,675.93; liabilities, $28,526,888.64; gross surplus, $6,488,787.29; new policies issued in 1878, 5,071, amounting to $15,570,355; old policies revived during 1878, 1,044, amounting to $5,869,858; total policies in force at the end of the year, $46,383, amounting to $157,737,356; received for premiums and annuities in 1878, $6,543,750.53; total paid policy holders for losses, matured endowments, annuities, etc., in 1878, $4,935,171.43.

Eraser is a knife with a cordate blade, sharpened on each edge, and adapted for erasing marks from paper by an abrading or cutting action, according to the angle at which it is held.

Erect, to raise or build up, as a house, pier, etc.

Ergot, or **Spurred Rye** [Fr. *ergot*, a cock's spur; Ger. *Mutterkorn*], the diseased seeds of *Secale cereale*, or common rye, produced by the attacks

Fig. 164. — Ergot of Rye.

of a fungus, which, taking possession of the ovary, destroys it, producing in its room a long, black, hard, hornlike body (Fig. 164). *E.* is remarkable for its specific stimulating effects upon the uterus, and is much employed in cases of difficult parturition. It deteriorates greatly by age, being subject to the attacks of a description of acarus resembling the cheese mite, but much smaller, which destroys the whole of the internal portion of the grain, leaving nothing but the shell and a considerable quantity of excrementitious matter. To prevent this the *E.* should be well dried, and then placed in bottles or tin canisters, and closely pre-

served from the air. The addition of a few cloves, or drops of the oil of cloves, or strong acetic acid, or a little camphor, will preserve this substance for years in close vessels. *Imp* free.

Erie, a city and port of entry, the capital of Erie Co., Pennsylvania, is situated on Lake Erie, opposite Presque Island, about 120 m. N. of Pittsburgh, lat. 42° 8' N., lon. 80° 10' W. It is very nearly equidistant from Cleveland and Buffalo on the Lake Shore R.R., which gives communication E. and W., and is the northern terminus of the Philadelphia and Erie R.R., which penetrates the lumber-region of the State, and also gives connection with Harrisburg and Philadelphia and the anthracite coal-fields. Erie is also the northern terminus of the Erie and Pittsburgh R.R., which passes through the bituminous coal-regions. Its inhabitants are engaged chiefly in various kinds of iron manufacture, and it possesses large rolling-mills. It has also leather manufactories, a brass foundry, petroleum refineries, and several large breweries. For many of its manufactories a large supply of water is required, and this is supplied from Lake Erie by powerful engines which force it to the top of a tower 200 feet high, whence it is distributed through the mains. The harbor, which is formed out of the natural bay, protected by a breakwater, is 3½ m. long, more than 1 m. wide, and from 9 to 25 feet deep. The principal shipments are coal, iron, and petroleum; and the total value of imports from Canada for the year 1878 was $70,801, and of exports, $55,671. The Pennsylvania R.R. Co. runs a line of first-class propellers between this port and the upper lakes, and over 50 sailing vessels are owned here. Pop. about 25,000.

Erie and Pittsburgh R.R. Co. runs from Newcastle to Girard, Pa., a distance of 81 m., with a branch from Dock Junction to Erie Dock, 3.47 m. This Co., whose offices are in Erie, Pa., was chartered in 1858. The road was open in 1865, and in 1870 it was leased for a term of 999 years to the Pennsylvania R.R. Co., which now operates it, for a rental of 7 % on stock and bonds. *Financial statement:* Cap. stock, $1,998,400; funded debt, $3,322,000, consisting of 1st mortgage, 7 % 20 year bonds, payable in 1882, $291,700; 2d mortgage, 7 % 25-year bonds, due 1898, $2,193,000; equipment mortgage, 7 % 30 year bonds, due 1900, $745,000.

Erie Canal. See CANAL.

Erie (Lake), one of the five great lakes drained by the St. Lawrence, lies between lat. 41° 22' and 42° 52' N., and lon. 79° and 85° W., having N. the fertile peninsula of Ontario, Canada, and S. and E. the States of Ohio, Pennsylvania, and New York. Its shape is elliptical; length S. W. to N. E. about 265 m.; breadth varying from 10 m. to about 65 m. in the centre. It receives near its W. extremity the superabundant waters of the upper lakes by the Detroit River, its own surplus waters being conveyed to Lake Ontario by means of the Niagara. Its mean height above the level of the ocean is estimated at 565 feet, being about 52 feet below that of lakes Michigan and Huron, and 322 feet above that of Lake Ontario. Its depth, which is less than that of any of the other great lakes of the St. Lawrence basin, is nowhere more than 312 feet, and in most parts is considerably under 200 feet. Its N. shore is rocky and dangerous; the opposite one has also long lines of rock. In addition to other impediments to navigation, a current, not perceptible in the other great lakes of the St. Lawrence system, sets constantly W., and N. W. or S. W. winds continually prevail; besides which, in consequence of its shallowness, a part of the lake is frozen over every winter, and traffic on it is obstructed by ice for some weeks in the spring after the navigation of the other lakes is open and unimpeded. Except the Detroit, Lake Erie receives few rivers of any consequence, and all, without exception, have bars at their mouths. The Ouse or Welland, which unites with its E. extremity, is its principal affluent, and has been taken advantage of for the construction of the Welland Canal, of which it forms a part, connecting the lakes Erie and Ontario, and avoiding the Falls of Niagara. This lake is very important as a channel of trade and steam navigation. It is liable to violent storms, which sometimes cause disastrous shipwrecks. The chief cities on its shores are Buffalo, Cleveland, Toledo, Erie, and Sandusky, which have good harbors.

Erie R.R. See NEW YORK, LAKE ERIE, & WESTERN R.R.

Eriometer, an instrument for measuring the diameter of minute particles and fibres, as wool, by ascertaining the diameter of any one of the series of colored rings which they produce.

Ermine [Fr. *hermine;* Ger. *Hermelin;* It. *armellina;* Russ. *gornostai*], a species of weasel (*Mustela candida*), about the size of a squirrel, abundant in all cold countries, particularly Russia, Norway, Lapland, etc., and producing a most valuable species of fur. In summer the *E.* is of a brown color, and is called the *stoat.* It is in winter only that the fur has that beautiful snowy whiteness and consistence so much admired. The tip of the tail is always of a brilliant shining black. It is used for ladies' winter apparel, and in Europe for the robes of kings, nobles, and judges. When made up the tails are inserted one to each skin, at regular distances and in the quincunx order or otherwise, according to the wearer's rank. The *Putorius noveboracensis* and other N. American white weasels are properly classed as *E.*, having white winter fur and the tip of the tail black, but their fur is inferior to that of the Russian *E.* Most of the so-called *E.* fur of commerce is simply white rabbit fur, with spots of black rabbit fur inserted. *Imp.* duty, see Furs.

Errand-Boy, a lad kept to deliver messages, or to do jobs of all kinds.

Errata, a published list of misprints, or typographical errors, which have escaped the eye of the author and the press reader.

Errhines, sternutatories; medicines which cause sneezing or mucous discharges when snuffed up the nose.

Eruginous, green with a blue tint, the color of verdigris.

Esame, **Esciame** [It.], a swarm of bees.

Escapement, in a clock or watch, is an apparatus for converting a *continuous* into an *intermittent* or *oscillatory* motion, which can more readily be made isochronous, or equal timed. A watch or clock always travels by leaps (made audible by the ticking), or alternate movements and stoppages. A small piece of metal called the *regulator* oscillates in a regular manner by a series of jerks; these jerks are manifested in the jerking movements of the seconds-hand. The *E.* is the apparatus which connects the regulator with the train of wheels. — In the common *vertical E.* for a watch or time-piece, the regulator is a horizontal wheel called the *balance*, which oscillates on a vertical axis. The axis or *verge* of the balance carries two small *pallets*, which catch into the teeth of a vertical *scape-wheel.* The *main-spring*, acting through the medium of the train of wheels, causes the teeth of the scape-wheel, one by one, to be caught by the pallets, and gives an oscillatory movement

to the balance. — The *anchor E.* (Fig. 165) is the one most commonly in use for both clocks and watches. It is so called from its resemblance to the

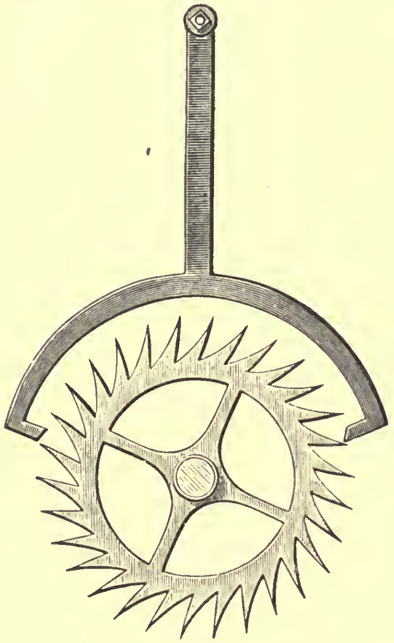


Fig. 165. — Anchor Escapement.

flukes of an anchor, the shaft of the anchor in the clock being parallel to the pendulum and connected with it. The *E.*-wheel is a spur-wheel. The pallets projecting from the extremities of the anchor flukes alternately catch into the teeth of a wheel, producing equidistant stoppages nearly like those just mentioned. The extremity of the pallet is inclined in such a manner that, as the tooth escapes, it gives impulse to the pendulum. As, after the pallet first engages a tooth, the swing continues for some time in the same direction, anchor *E.* are of two kinds, according to the manner of their action upon the train during this swing. In Hooke's *E.* the surfaces of the pallets are so inclined that by their pressure on the tooth they turn the train slightly backward, or cause it to *recoil*, up to the end of the swing. In the *dead-beat* escapement, invented by Graham early in the last century, the surfaces of the pallets are circular arcs, having the centre of motion for their centre, so that during the swing the train simply stands still. Though the dead-beat *E.* is now generally used in clocks, there are not wanting those who prefer the recoiling *E.* Besides the anchor dead-beat, there are several other very ingenious forms, among which may be mentioned Lepaute's *pin-wheel E.*, McDowall's *ruby-disk E.*, and Denison's *three-legged dead E.* — The *cylinder E.* (Fig. 166), which is used for watches, is so called because a hollow cylinder of steel or ruby replaces in part the verge of the balance. This cylinder is cut away on one side for about one fourth of the circumference, in order to allow the pallets, which are small triangular pieces of steel, to enter the interior. During the swing the pallet rests with little friction on the smooth exterior or interior surface. In entering and in escaping it gives an impulse to the balance. The pallet is not in the plane of the wheel, but stands on a short stem at right angles to this plane. Hence, the cylinder must be much more extensively cut away at the point where the wheel passes; and on this account the cylinder *E.*, though performing very well, is too frail to be popular in use. — The *chronometer* or *free E.*, of Arnold (Fig. 167), is the most perfect, delicate, and satisfactory in its operations of all the *E.* It is also kept more carefully, at least in marine chronometers, as the gimbal-joint hanging enables it to maintain a constant position relatively to the horizon, and it is carefully guarded from jars. In this *E.* the train is locked by a tooth projecting from a light bar tangent to the *E.*-wheel, which yields by bending and not by turning on a pivot, the fixed extremity being a spring. The free extremity carries another delicate spring parallel to itself and extending a little beyond it. A tooth on the verge passes this slight spring in one direction without sensible resistance. On its return the bar behind the spring prevents its bending, and so is carried along with it, unlocking the train. The train being released, a tooth of the escapement-wheel strikes a pin, or enters a notch, connected with the verge, and gives an impulse to the balance. — The *Duplex E.* of Lepine has two scape-wheels and two pairs of pallets, one for the stop and the other for the impulse. — The *remontoir* gives an impulse to the pendulum by means of a small weight or spring independent of the force of the train. The clock-train winds up the maintaining force at every beat or every few beats. — The *horizontal E.* has a scape-wheel in a plane perpendicular to the axis of the balance; and the teeth are caught in a peculiar way by the edges of a half-cylinder. — The *lever E.* has a lever added to the action of the scape-wheel, to give impulse to the balance. — The *gravity E.* is one which has been made to assume many different forms; a variety devised by Mr. Denison is especially intended for astronomical clocks. The making of these delicate pieces of mechanism is among the nicest operations of the horological art. See Clock, and Watch.

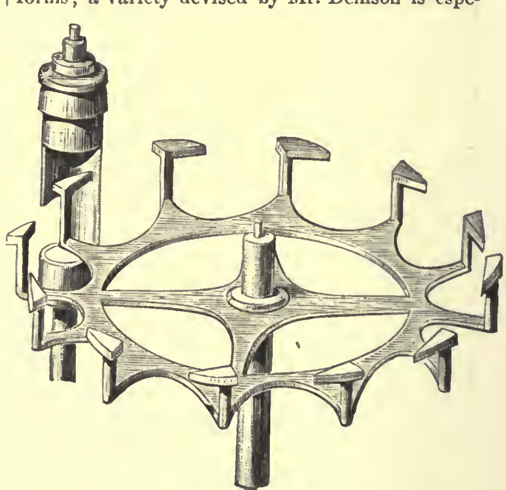


Fig. 166. — Cylinder Escapement.

Escharotics are substances that destroy the living organic bodies with the production of an "eschar" or "scab." *E.* have been divided into two classes, *mechanical* and *chemical*. Among the

former are actual cauteries, as a heated iron, moxas, etc.; among the latter are all those substances commonly known as caustics.

Eschen, a division of the gold and silver pound weight in Hamburg; 544 eschens make one troy pound.

Escompte [Fr.], discount; money deducted for interest.

Escort, a body of armed men sent for security of convoy, as with a gold freight from the mines to a seaport for shipment.

Escritoire, a writing-desk; a chest of drawers with a flap and convenience for writing.

Escropulo, the 192d part of the Portuguese and Spanish mark. The scruple is used in Brazil for weighing precious stones, consisting of 3 carats, or about 9¼ English grains.

Escudo. See SCUDO.

Esculent, something that is wholesome and eatable; good as food for man.

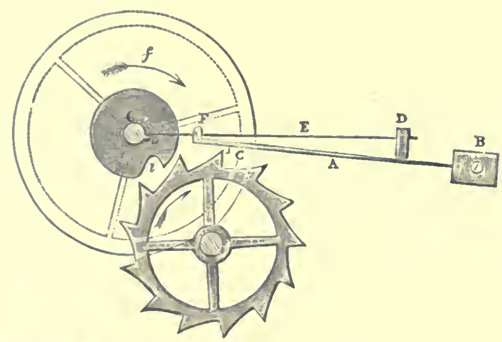


Fig. 167. — CHRONOMETER OR FREE ESCAPEMENT.

Escutcheon, a shield for a key-hole on a door, etc. — The part of a merchant-vessel's stern where her name is written.

Espagnolette [Fr.], a sash-window fastening.

Espalier [Fr.], a low lattice-work for training dwarfed fruit-trees on.

Esparto or **Spanish Grass**, a species of rush (*Macrochloa tenacissima*), resembling the ornamental feather-grass of gardens. It is indigenous to the South of Spain and the North of Africa, and is especially abundant in the sterile and rugged parts of Murcia and Valencia, and in Algeria. Its commercial name in Algeria is *Alfa* or *Halfa*. It attains a height of three or four feet. The stems are cylindrical, and clothed with short hair, and grow in clusters of from two to ten feet in circumference; when young they serve as food for cattle, but after a few years' growth acquire great toughness of texture. The leaves vary from six inches to three feet in length, and are gray-green in color. On account of their tenacity of fibre and flexibility they have for centuries been employed for the making of ropes, sandals, baskets, mats, and other articles. Ships' cables of *E.*, being light, have the quality of floating on water, and have long been in use in the Spanish navy. *E.* leaves contain 56 per cent by weight of fibre, or about 10 per cent more than straw, and hence have come largely into requisition as a substitute for linen rags in the manuf. of paper. When required for paper-making the leaves should be gathered before they are quite matured; if, however, they are obtained too young, they furnish a paper having an objectionable semitransparent appearance. The leaves are gathered by hand, and from two to three hundredweight may be collected in a day by a single laborer. They are generally obtained during the dry summer months, as at other times their adherence to the stems is so firm as often to cause the uprooting of the plants in the attempt to remove them. *E.* may be raised from seed, but cannot be harvested for 12 or 15 years after sowing. The increased demands of the paper-trade have led to forced cropping in some districts, where in consequence there has been a falling off of from 2 to 10 per cent in production. For the processes of the paper manufacturer *E.* is used in the dry state, and without cutting: roots and flowers and stray weeds are first removed, and the material is then boiled with caustic soda, washed, and bleached with chlorine solution. Sundry experiments have been made to adapt *E.* for use in the coarser textile fabrics. England is the principal market for *E.*; it is worth on an average $35 per ton. Several attempts of making paper out of *E.* having failed in the U. States, its importation is limited to a few tons used as filling by certain ships importing manganese ores from Spain. The Department of Agriculture at Washington has been advocating the introduction of *E.*-grass in the American cultivation, but the plant is of a peculiar local nature which cannot be easily transferred to foreign soils and latitudes. *Imp.* free.

Esprit. The French word for spirit. This term is commonly applied to alcoholic solutions of the essential oils, and to various odorous and aromatic essences sold by the perfumers and druggists as articles of the toilet. See ESSENCE, SPIRIT, etc.

Esquif [Fr.], a small skiff or ship's boat.

Esquisse [Fr.], a sketch; a rough outline drawing.

Essence, a volatile oil obtained from a vegetable substance by distillation, or a strong solution of them in alcohol. We confine ourselves here to some general considerations on compound *E.*, or those that undergo some preparation beyond being merely extracted from vegetables by distillation along with water; the latter being considered under the article OIL (VOLATILE). — The concentrated preparations of the pharmaceutist and the perfumer, termed *E.*, are mostly prepared by digesting the active ingredient or ingredients in rectified spirit of wine, either with or without the addition of a certain portion of water; or they are extemporaneously formed by dissolving a portion of the essential oil of such substances in the spirit. In this way are made the essences of lavender, musk, ginger, etc. When it is desired only to obtain the aromatic and volatile portion of the ingredients, the latter are usually digested in the spirit for a few days, and then submitted to distillation, when the alcohol comes over loaded with aromatic essential oil, or other volatile matter. In this way are prepared most of the fragrant essences of the perfumer and druggist, when simple solution of the essential oils in alcohol is not resorted to. In many cases the active principles of the ingredients are partly volatile and partly fixed, or at least do not readily volatilize at the temperature at which alcohol distils over. This is the case, for instance, with the active portion of ergot and Jamaica ginger. In such cases digestion alone should be adopted. When the principles of organic substances, of which it is desired to obtain a concentrated solution, are resinous or oily, or little soluble in weak spirit (which is mostly the case), the strongest rectified spirit of wine should alone be employed. In the preparation of *E.* without distillation, the method by percolation

or displacement is preferable to that of simple maceration and expression, when the nature of the ingredients and other circumstances render it applicable, as it is not only more economical, but a more concentrated solution may thereby be obtained. At the same time, however, the reader should remember, that this mode of operating requires much greater experience and skill to insure success than the former method. This clumsiness of manipulation is the common cause of the failures which are so frequently met with in the preparation of these articles. The ingredients for the preparation of *E.* must undergo the same operations of bruising, powdering, or slicing, as directed under TINCTURE, previous to digestion in the spirit, or other menstruum; and the length of time they should be allowed to infuse, when this method alone is adopted, should not be less than ten days; but this time may be advantageously extended to a fortnight, or even longer. During the whole of this period frequent agitation should be employed, and when the ingredients are so bulky as to absorb the whole of the fluid, the vessel which contains them should be securely fastened by a bung or stopper covered with bladder, and inverted every alternate day. By this means every portion of the ingredients will be equally exposed to the action of the menstruum. In all such cases the method of displacement, or percolation, is preferable. For the *E.* used as perfumes and for flavoring, not only must the spirit be perfectly tasteless and scentless, but it must be also quite devoid of color. — An *E.* whose formula cannot be procured may be readily prepared by applying the general directions given above, or by employing the formula given for the preparation of the *E.* of some similar substance, merely varying the characteristic ingredient. Thus, were it desired to form an *E.* of ambergris or of myrrh, and no formulæ could be found for these preparations, the tyro would consider in what menstruum the active principles of these substances were most soluble. This, he would immediately see by reference to their properties, is rectified spirit of wine. He would next have to decide on the proper strength of his *E.* In this he must be guided, either by the strength of the like preparations of other makers, or by his own judgment of what would be useful, novel, or convenient. Suppose he decided that his *E.* should represent $\frac{1}{10}$th of its weight of the solid ingredient. He would then take 2 oz. of ambergris or myrrh, and 20 oz. of rectified spirit, which he would digest together for 10 days or a fortnight in the manner described above. Had the required preparation been an *E.* of senna (for example), he would probably recollect, or might easily ascertain by reference, that the active properties of senna are soluble in both water and weak spirit. Then, to make an *E.* 4 times as strong as the tincture of the pharmacopœia, 7 oz. of senna, and 1 pint of proof spirit, should be employed, with due digestion, as before. See OIL (VOLATILE), TINCTURE, SPIRIT, etc. — *Imp.* duty, as essential oil, see OIL (VOLATILE); *E.* for perfumes, see TOILET.

Essence d'Orient, a beautiful glistening matter procured from the blay or bleak, a fish of the genus *cyprinus*. This substance, which is found principally at the base of the scales, is used in the manufacture of artificial pearls. A large quantity of the scales being scraped into water in a tub, are there rubbed between the hands to separate the shining stuff which subsides on repose. The first water being decanted, more is added with agitation till the essence is thoroughly washed from all impurities, when the whole is thrown upon a sieve; the substance passes through, but the scales are retained. The water being decanted off, the essence is procured in a viscid state, of a bluish-white color, and a pearly aspect. The intestines of the same fish are also covered with this beautiful, glistening matter. Several other fish yield it, but in smaller proportion. When well prepared, it presents exactly the appearance and reflections of the real pearls, or the finest mother-of-pearl; properties which are probably owing to the interposition of some portions of this same substance, between the laminæ of these shelly concretions. Its chemical nature has not been investigated; it putrefies readily when kept moist, an accident which may, however, be counteracted by water of ammonia. See PEARL.

Essential Oil. See OIL (VOLATILE).

Estada, the Spanish fathom of six feet.

Estadal, a Spanish measure of 100 varas, equal to 274,600 feet.

Estadio, a furlong, the eighth part of the Portuguese and Spanish mile, usually subdivided into 125 paces, each of five feet; but in Spain the estadio measures 190¼ yards, and in Portugal, 281½ yards.

Estado [Sp.], a statement or account.

Estafette, a French courier or express.

Estame [Fr.], worsted; woollen yarn.

Estaminet, a French alehouse or coffee-house, where smoking is allowed.

Estancia, the Spanish name for a grazing-farm or pasture-ground.

Estate, the lands or tenements to which a person has a clear title and interest.

Estimate, to appraise or value; to judge of by inspection. An estimate is an approximate calculation made of the probable cost or charges of any undertaking, as of a contract for work and labor to be done, a building to be constructed, etc., quantity of materials required for any work, etc.

Estimator, an appraiser; one who computes or values.

Estimo, in Italian, an impost, tax, or customs duty.

Establishment of the Port, a term used by writers on the tides, to denote the interval between the time of high water at any given port and the time of the moon's transit immediately preceding the time of high water, when the moon is in syzygy; that is, at the new or full moon. This interval is influenced by local circumstances, and consequently different at different places. See TIDE.

Estridge, the fine soft down which lies under the feathers of the ostrich, which was formerly used as a substitute for beaver in hat-making, and of the coarser kind a stuff was fabricated.

Étagère, a piece of cabinet furniture; a what-not, sideboard, dumb-waiter, or set of shelves.

Étaim [Fr.], the finest part of carded wool.

Étain [Fr.], tin, pewter, or an alloy of tin and lead.

Étalon, the French name for the standard for weights and measures; also a stallion.

Etching, a species of engraving, in which the design is formed on the plate by a pointed tool and the action of an acid, or some other fluid, instead of being cut out by the graver. The two countries in which *E.* has been most practised are Holland and France. It has also been successfully practised in Italy, Germany, and England, but not to so great an extent. It has resembled line-engraving in receiving a powerful impulse from celebrated painters; but whereas, with the

exception of Albert Dürer, the painters have seldom been practical line-engravers, they have advanced *E.* not only by advice given to others, but by the work of their own hands. Rembrandt and Claude were practical and very skilful workmen in *E.*, and their works had on this art an influence which still continues. Ostade, Ruysdael, Berghem, Paul Potter, Karl Dujardin, etched as they painted, and so did a greater than any of them, Vandyke. In the earlier part of the present century *E.* was almost a defunct art, except as it was employed by engravers as a help to get faster through their work, of which "engraving" got all the credit, the public being unable to distinguish between etched lines and lines cut with the graver. During the last fifteen or twenty years, however, there has been a great revival, which has extended all over Europe and the U. States, though France has had by far the largest and most important share in it. It was hoped, at the beginning of this revival, that it would lead to the production of many fine original works; but the commercial law of demand and supply has unfortunately made modern *E.* almost entirely the slave of painting. Nearly all the clever etchers are occupied in translating pictures, which many of them do with remarkable ability, even to the very touch and texture of the painter. The comparative rapidity of the process, and the ease with which it imitates the manner of painters, have caused *E.* to be now very generally preferred by publishers for the translation of all pictures except those belonging to a severe and classical style of art, for which the graver is, and will always remain, better adapted than the *E.*-needle. Yet, notwithstanding the present commercial predominance of *E.* from pictures, there are still in Europe, and we have at the present day in Boston, New York, and Philadelphia, some artists and eminent amateurs who cultivate original *E.* with success, and produce works of very various interest and power.

To prepare a plate for *E.*, it is first covered with *E.*-ground, a composition which resists acid. The qualities of a ground are to be so adhesive that it will not quit the copper when a small quantity is left isolated between lines, yet not so adhesive that the *E.* point cannot easily and entirely remove it; at the same time a good ground will be hard enough to bear the hand upon it, or a sheet of paper, yet not so hard as to be brittle. The best is that of Abraham Bosse, which is composed as follows: Melt 2 oz. of white wax; then add to it 1 oz. of gum-mastic in powder, a little at a time, stirring till the wax and the mastic are well mingled; then add, in the same manner, 1 oz. of bitumen in powder. There are three different ways of applying an *E.*-ground to a plate. The old-fashioned way was to wrap a ball of the ground in silk, heat the plate, and then rub the ball upon the surface, enough of the ground to cover the plate melting through the silk. To equalize the ground a dabber was used, which was made of cotton-wool under horse-hair, the whole enclosed in silk. This method is still used by many artists, from tradition and habit, but it is far inferior in perfection and convenience to that which we will now describe When the *E.*-ground is melted, add to it half its volume of essential oil of lavender, mix well, and allow the mixture to cool. You have now a paste which can be spread upon a cold plate with a roller; these rollers are covered with leather and made (very carefully) for the purpose. You first spread a little paste on a sheet of glass (if too thick, add more oil of lavender and mix with a palette-knife), and roll it till the roller is quite equally charged all over, when the paste is easily transferred to the copper, which is afterwards gently heated to expel the oil of lavender. In both these methods of grounding a plate the work is not completed until the ground has been smoked, which is effected as follows: The plate is held by a hand-vice if a small one, or, if large, is fixed at some height, with the covered side downwards. A smoking torch, composed of many thin beeswax dips twisted together, is then lighted and passed repeatedly under the plate in every direction, till the ground has incorporated enough lamp-black to blacken it. The third way of covering a plate for *E.* is to apply the ground in solution as collodion is applied by photographers. The ground may be dissolved in chloroform or in oil of lavender. The plate being grounded, its back and edges are protected from the acid by Japan varnish, which soon dries, and then the drawing is traced upon it. The best way of tracing a drawing is to use sheet gelatine, which is employed as follows: The gelatine is laid upon the drawing, which its transparency allows you to see perfectly, and you trace the lines by scratching the smooth surface with a sharp point. You then fill these scratches with fine black-lead in powder, rubbing it in with the finger, turn the tracing with its face to the plate, and rub the back of it with a burnisher. The black-lead from the scratches adheres to the *E.*-ground and shows upon it as pale gray, much more visible than anything else you can use for tracing. Then comes the work of the *E.*-needle, which is merely a piece of steel sharpened more or less. Turner used a prong of an old steel fork, which did as well as anything, but neater *E.*-needles are sold by artists' color-makers. The needle removes the acid and lays the copper bare. Some artists sharpen their needles so as to present a cutting edge which, when used sideways, scrapes away a broad line: and many etchers use needles of various degrees of sharpness to get thicker or thinner lines. It may be well to observe, in connection with this part of the subject, that whilst thick lines agree perfectly well with the nature of woodcut, they are very apt to give an unpleasant heaviness to plate engraving of all kinds, whilst thin lines have generally a clear and agreeable appearance in plate engraving. Nevertheless, lines of moderate thickness are used effectively in *E.* when covered with finer shading, and very thick lines indeed were employed with good results by Turner when he intended to cover them with mezzotint, and to print in brown ink, because their thickness was essential to prevent them from being overwhelmed by the mezzotint, and the brown ink made them print less heavily than black. Etchers differ in opinion as to whether the needle ought to scratch the copper or simply to glide upon its surface. A gliding needle is much more free, and therefore communicates a greater appearance of freedom to the *E.*, but it has the inconvenience that the *E.*-ground may not always be entirely removed, and then the lines may be defective from insufficient biting. A scratching needle, on the other hand, is free from this serious inconvenience, but it must not scratch irregularly so as to *engrave* lines of various depth. The *biting* in former times was generally done with a mixture of nitrous acid and water, in equal proportions; but in the present day a Dutch mordant is a good deal used, which is composed as follows: Hydrochloric acid, 100 grammes; chlorate of potash, 20 grammes; water, 880 grammes. To make it, heat the water, add the chlorate of potash, wait till it is entirely dissolved, then add the acid. The nitrous mordant acts rapidly, and causes ebullition; the Dutch mordant acts slowly, and causes no ebullition. The nitrous mordant widens the lines; the Dutch mordant bites in depth, and does not widen the lines to any perceptible degree. The time required for both depends upon temperature. A mordant bites slowly when cold, and more and more rapidly when heated. To obviate irregularity caused by difference of temperature, it is a good plan to heat the Dutch mordant artificially to 95° F. by lamps under the bath (for which a photographer's porcelain tray is most convenient), and keep it steadily to that temperature; the results may then be counted upon; but whatever the temperature fixed upon, the results will be regular if it is regular. To get different degrees of biting on the same plate the lines which are to be pale are "stopped out" by being painted over with Japan varnish or with *E.*-ground dissolved in oil of lavender, the darkest lines being reserved to the last, as they have to bite longest. When the acid has done its work properly the lines are bitten in such various degrees of depth that they will print with the degree of blackness required; but if some parts of the subject require to be made paler, they can be lowered by rubbing them with charcoal and olive oil, and if they have to be made deeper they can be rebitten, or covered with added shading. Rebiting is done with the roller above mentioned, which is now charged very lightly with paste and rolled over the copper with no pressure but its own weight, so as to cover the smooth surface, but not fill up any of the lines. The oil of lavender is then expelled as before by gently heating the plate, but it is not smoked. The lines which require rebiting may now be rebitten, and the others preserved against the action of the acid by stopping out. These are a few of the most essential technical points in *E.*, but there are many matters of detail, for which the reader is referred to the special works on the subject.

E. on glass. The ground is laid on, and the design "scratched in" in the usual way, when liquid hydrofluoric acid is applied, or the glass is exposed to the action of hydrofluoric acid gas. The former renders the surface of the *E.* transparent, the latter opaque. A simple modification of the process is to wet the design with sulphuric acid, and then to sprinkle on some finely pulverized fluor spar (fluoride of calcium), by which means hydrofluoric acid is set free and attacks the glass This method may be very easily applied to the graduation of glass vessels, thermometer tubes, etc.

Electro E. This mode of *E.* is based upon the destructive action of certain "anions" during "electrolysis." If two plates of copper be connected with the opposite ends of a voltaic battery, and placed in a vessel containing very dilute sulphuric acid, the plate connected with the copper of the battery will be attacked by the anion oxygen which is released

during the decomposition of the acid. This destructive action can be localized at pleasure by covering certain parts of the plate with a protecting stratum of varnish, ordinary *E.*-ground, for instance. In the practice of electro-*E.*, the drawing is "scratched in" in the usual way through an ordinary ground; a stout wire is then soldered to the plate, and this, as well as the back of the plate, is coated with sealing-wax varnish. Thus prepared, the plate is placed in a suitable "decomposition cell" opposite a plate of somewhat similar size, and the two are connected respectively with the copper and zinc of a Daniell's cell, or the silver and zinc of a Smee's cell. After about ten minutes the plate is removed, washed, and dried; and when the "fine work" has been stopped out with Brunswick black, it is returned for another space of ten minutes. By alternately exposing the plate to the action of the decomposing fluid, and "stopping out" parts of the work, the required gradation in tints is obtained. The exact duration of the various exposures, as well as their number, must of course be regulated by circumstances.

Ether, a name given to numerous chemical compounds, generally derived from alcohols by the action of acids. The most important body of this series is the *common E.* or *ethylic E.*, commonly called *sulphuric E.*, a colorless, transparent, highly volatile, fragrant, inflammable liquid, obtained by distilling a mixture of sulphuric acid and alcohol. It has a penetrating and agreeable smell, and a burning, sweetish taste; its evaporation produces the sensation of extreme cold; when prevented, a sensation of heat is experienced. Its sp. gr. varies between .712 and .724. If it contains water it begins to crystallize in brilliant white plates when cooled to —24° F., and become a white crystalline mass at —46° or —47° F.; but if absolutely pure, *E.* cannot be solidified by any degree of cold that can be produced, it remaining fluid when placed in contact with solid carbonic acid, at a temperature of about —148° F. Boils at 96° or 97° F.; is very combustible; is soluble in about 10 parts of distilled water, and mixes with alcohol in all proportions. It abstracts corrosive sublimate, terchloride of gold, sesquichloride of iron, and many of the alkaloids, from their watery solutions, and is hence invaluable in analysis and pharmacy. It readily dissolves the volatile and fixed oils, and most fatty matters, as well as sulphur and phosphorus in small quantities. By exposure to light and air it absorbs oxygen, and water and acetic acid are gradually formed. It is decomposed by exposure to a high temperature. The greatest degree of cold yet produced (—166° F.) has resulted from the admixture of *E.* with solid carbonic acid. *E.* is powerfully stimulant, narcotic, and antispasmodic, and externally refrigerant, if allowed to evaporate, or stimulant and counterirritant if its evaporation is prevented, and is used in various diseases. Applied to the forehead by means of the fingers or a strip of linen, it generally relieves simple cases of nervous headache. In *pharmacy* it is largely employed in the preparations of tinctures, alkaloids, spirits, etc.; and in *chemistry* is invaluable in organic analyses. Its principal commercial application is as a solvent for pyroxyline, in the manufacture of collodion. It is also employed as a solvent of resins, india-rubber, etc., in the preparation of varnishes, and for several other useful purposes. Shortly before the discovery of chloroform, it was found that when the vapor of *E.* was inhaled it gradually produced insensibility to pain. It was therefore employed as an anæsthetic in surgical operations. Having been found less efficient than chloroform, and more troublesome to administer, its use for this purpose has been abandoned.

E. may be recognized by its volatility, odor, taste, sparing solubility in water, admixture with alcohol in all proportions, great inflammability (burning with a yellowish-white flame), and its power of dissolving fats and resins. Its further identification can only be effected by ultimate analysis. The *E.* of commerce generally contains alcohol, water, or acetic acid, and sometimes all of them. Its usual sp. gr. fluctuates between .733 and .765. Exposed to the air, it volatilizes entirely. It turns litmus paper red; sometimes very slightly, and occasionally even not at all. ½ fluid ounce mixes completely with ½ pint of water. Pure *E.* should, however, be neutral to test-paper, although seldom so. When shaken in a minim measure with half its volume of concentrated solution of chloride of calcium, its volume should not lessen. 10 fluid ounces of water should only dissolve 1 fluid ounce of *E.*, and remain transparent. — *E.* rapidly evaporates at common temperatures when kept in corked bottles, and even in bottles secured with ground-glass stoppers and tightly tied over with bladder and leather; it also becomes sour by age. To prevent this waste, the stoppers should fit accurately, and the bottles should be placed in as cool a situation as possible. Bottles furnished with ground-glass caps, as well as stoppers, are frequently employed. — The vapor of *E.* is very inflammable, and when mixed with atmospheric air it forms a violently explosive mixture. The density of this vapor is 2.586, that of air being 1; hence it rapidly sinks and frequently accumulates in the lower parts of buildings, especially cellars which are badly ventilated, in the same way as water does. The only remedy is thorough ventilation. Many serious accidents have arisen from this cause, for no sooner is a light carried into an apartment where such vapor is present than an explosion takes place. — *Imp.* duty, $1 per lb.

Etiquette, ceremony. — In France, a label or ticket affixed to a package.

Etna, a table cooking-utensil, heated by a spirit-lamp.

Étoupe [Fr.], tow; lint; the coarsest part of flax or hemp; oakum.

Étui, a case for holding small articles, as a lady's work-box and case for articles of needle-work.

Eudiometer, an instrument for ascertaining the purity or salubrity of air, or rather for determining the quantity of oxygen in any given bulk of elastic fluid.

Euphorbium, a concrete gum-resin obtained from several East Indian species of *Euphorbia*. It is inodorous, and, when first chewed, has little taste; but it soon gives a very acrid, burning impression to the tongue, palate, and throat, which is very permanent, and almost insupportable. At one time it was used in medicine, both externally and internally; but in consequence of its violent action its use is now discontinued. Its chief employment is for veterinary purposes. It is imported in serons, containing from 100 to 150 lbs. It is in small, hollow, forked pieces, often mixed with seeds and other impurities.

Eureka and Palisade R.R. Co. runs from Palisade, Nev., to Eureka, Nev., 90 m., with a branch line from the latter place to Ruby Hill, a distance of 7 m. The Co., whose offices are in Eureka, was chartered in 1874, and the road opened in 1876. The financial standing of this Co. is unknown.

Evansville and Terre Haute R.R. runs from Evansville to Terre Haute, Ind., 109 m., with an extension from Terre Haute to Rockville, 21.88 m. This Co., whose offices are in Evansville, was formed by the consolidation of the Crawfordsville and Illinois R.R., and the Terre Haute and Vincennes, and took its present title in 1877. *Financial Statement:* Cap. stock, common, $1,020,416.27; preferred 7 %, $100,000; funded debt, $1,017,000, as follows, — 1st mortgage (Evansville and Illinois R.R., 51 m.), issued 1852, payable 1887, $281,000, interest 7 % (Jan. and July); 1st mortgage sinking fund (Evansville and Crawfordsville R.R., 109 m.), issued 1854, payable 1887, $611,000, interest 7 % (May and Nov.); 1st mortgage (Rockville Extension), issued 1860, $125,000, interest 7 % (Feb. and Aug.).

Evansville, Terre Haute, and Chicago R.R. runs from Terre Haute, Ind., to Danville, Ill., a distance of 55.28 m. This Co., whose offices are

in Terre Haute, was chartered in 1869, and the road opened in 1871. It uses the Rockville Extension of the Evansville and Crawfordsville R.R. from the Junction to Terre Haute, a distance of 6 m., for which it pays a rent of $3,000 per annum. The Co. also rents on lease the Indiana Black Coal R.R. *Financial statement*, 1879: Cap. stock, $458,-691; funded debt, $1,100,000, as follows, — 1st mortgage on road in Ind., issued 1870, payable 1900, $775,000, interest 7% (May and Nov.); 1st mortgage on road in Ill., and 2d mortgage on road in Ind., issued in 1873, payable 1903, $325,000, interest 7% (Jan. and July).

Evaporameter, a hygroscope or atmometer, an instrument for ascertaining the evaporation of fluids.

Evaporation, the conversion of a fluid into vapor by means of heat, diminished atmospheric pressure, or exposure to a dry atmosphere.

E. is had recourse to: 1. For the vapor as a source of heat or power, as in the case of steam-boilers, etc.; 2. To separate volatile fluids from impurities or other bodies, which are either fixed or less volatile; 3. To recover solid bodies from their solutions, as in the preparation of extracts, chemical salts, etc.; 4. To concentrate or strengthen a solution by the expulsion of some of the fluid matter that forms the menstruum; 5. To purify liquids by the dissipation of the volatile matters which may contaminate them. It is found that, under ordinary circumstances, *E.* is confined to the surface of the heated liquid, and is therefore slower or quicker, in proportion to the extension of that surface. Hence has arisen the adoption of wide, shallow vessels for containing fluids during their exposure to heat for this purpose. *E.* proceeds most rapidly when a current of air (especially hot and dry air) is made to pass over the surface of the fluid; as in this case the vapor is prevented resting upon the surface, and impeding the process by its pressure. For a similar reason, liquids evaporate more rapidly in vessels partially covered than in open ones. In the former case the cool incumbent air condenses and throws back a portion of the vapor, which thereupon, besides its cooling action, offers mechanical resistance to the diffusion of the vaporous particles as they arrive at the surface of the liquid. In the latter case these obstacles are avoided, and the impetus of the vapor pouring forth from a contracted orifice, or pipe, not only readily overcomes the pressure of the atmosphere, but offers less surface for its cooling action, until it has passed much beyond the points at which it can exert any influence on the fluid from which it has escaped. In this way the chemical action of the atmosphere on the liquid operated on is also considerably lessened. On the small scale, shallow capsules of glass, wedgwood ware, porcelain, or metal, are commonly employed as evaporating vessels, and these are exposed to heat by placing them over a lamp, or naked fire, or in a water bath, or sand-bath, according to the temperature at which it is proper to conduct the process. On the large scale, high-pressure steam is usually employed as the source of heat. The term "spontaneous *E.*" is applied to the dissipation of a fluid by mere exposure in open vessels, at the common temperature of the atmosphere, and without the application of artificial heat. The celerity of this species of *E.* wholly depends on the degree of humidity of the surrounding air, and differs from the former, in which the rate of *E.* is proportionate to the degree of heat at which the process is conducted, and the amount of pressure upon the surface of the liquid. *E. in vacuo* (as it is called) is conducted under the receiver of an air-pump, or in an attenuated atmosphere, produced by filling a vessel with steam, by which means the air is expelled, when all communication with the external atmosphere is cut off, and the vapor condensed by the application of cold. Fluids are also evaporated in air-tight receivers over sulphuric acid, by which they are continually exposed to the action of a very dry atmosphere. When such a receiver is connected with an air-pump in action, *E.* proceeds with increased rapidity, and intense cold is produced. If the bottom of a pan, and the portion of the sides immersed in a hot fluid medium (solution of chloride of calcium, for example), be corrugated, so as to contain a double expanse of metallic surface, that pan will evaporate exactly double the quantity of water, in a given time, which a like pan, with smooth bottom and sides, will do, immersed equally deep in the same bath. If the corrugation contain three times the quantity of metallic surface, the *E.* will be threefold in the above circumstances. But if the pan, with the same corrugated bottom and sides, be set over a fire, or in an oblong flue, so that the current of flame may sweep along the corrugations, it will evaporate no more water from its interior than a smooth pan of like shape and dimensions placed alongside it in the same flue, or over the same fire. In the laboratory, steam heat is now almost exclusively employed. Copper or tinned, glazed, or silvered pans, boilers, and stills are surrounded by a "jacket" of cast iron, and high-pressure steam admitted between the two. By due management of the supply-cock, a range of temperature may be thus obtained extending from about 90° to 325° F. It is found that, under ordinary circumstances, 10 sq. feet of heated surface will evaporate fully 1 lb. of water per minute; and that a thin copper tube exposing 10 feet surface will condense about 3 lbs. of steam per minute, with a difference of temperature of about 90° F. This is equal to 30° F. per lb.; and, consequently, the heat of the steam employed to produce the *E.* should be 212° + 30° = 242° F.

Evaporator, an apparatus for condensing vegetable juices, of which there are many varieties, generally consisting of a furnace and pan.

Even Keel, a vessel which is loaded so as to draw the same water abaft as forward.

Eventail, the French word for a fan.

Evergreens, plants which retain their verdure throughout the year, such as pines, laurels, hollies, etc.

Ever-pointed Pencil, a sliding screw pencil-case, by which the lead is brought forward as fast as wear renders it necessary.

Evidence, oral or written testimony given by a witness.

Evolutions, the movements of a vessel or fleet.

Ewe-Cheese, cheese made from the milk of sheep.

Ewer, a water-pitcher with a wide spout.

Ex, a Latin preposition, which denotes out of, or from.

Examination, a careful search or inspection; a judicial trial, inquiry, or proceeding.

Examiner, an inspector or investigator; one appointed to test or scrutinize accounts, or to assay by experiments.

Excavation, a digging or hollowing out.

Excavator, a machine for excavating; also, one who cuts or digs out earth.

Exchange, a term that is used in reference to those transactions by which the debts of persons residing at a distance from their creditors are liquidated without the transmission of money; being employed by merchants both to designate the bills or negotiable instruments by which transactions of this kind are conducted, and the varying price or *course* of such instruments in the market. The nature, constitution, and negotiation of BILLS OF EXCHANGE having been already explained under that head, the present article will be devoted to an explanation of the principles by which *E.* transactions are regulated. — Among cities or countries having any considerable intercourse together, the debts mutually due by each other approach, for the most part, near to an equality. There are at all times, for example, a considerable number of persons in New York indebted to London; but, speaking generally, there are about an equal number of persons in New York to whom London is indebted. And hence, when A of New York has a payment to make to B of London, he does not remit an equivalent sum of money to the latter, but he goes into the market and buys a *bill* upon London; that is, he buys an order from C of New York addressed to his debtor D of London, requesting him to pay the amount to A or his order. A, having indorsed this bill or order, sends it to B, who receives payment from his neighbor D. The convenience of all parties is consulted by a transaction of this sort. The debts due by A to B, and by D to C, are extinguished without the intervention of any money. A of New York pays C of ditto, and D of London pays B of ditto. The debtor in one place is substituted for the debtor in another; and one or two postages form the whole expense. All risk of loss is obviated. — A bill of *E.*, therefore, may be defined to be an order

addressed to a person residing abroad, directing him to pay a determinate sum of foreign money to the person in whose favor it is drawn, or to his order. The amount of foreign money, therefore, to be paid is fixed by the bill; but the amount of American money (or money of the country in which the drawer resides), to be given for the purchase of the bill, is by no means fixed, but is continually varying. The various elements entering into the valuation of foreign bills, or, in other words, the rate of foreign *E.*, may be conveniently embraced under the following heads: (1) par of *E.*; (2) supply and demand of bills; (3) rate of interest; (4) cost of specie remittance, to which may be added, what is always implied, (5) correct judgment of the force and duration of the cause or causes affecting the rate of *E.*, or its opposite, panic. — 1. *Par of E.* Without some common medium of value in commercial countries bills of *E.* could not be drawn between one and another. The "cash" of China has played no more part in the foreign *E.* than the cowries of Africa; but since a mint has been established in Japan, from which gold pieces are issued under public regulation as to weight and fineness, there may be no difficulty in ascertaining the monetary equivalency at Yokohama of any debt due by Japan to the U. States, or *vice versa.* The nations have thus found a medium of *E.* in bullion, in gold or silver, or in both. In countries of the double standard, it has been usual to modify the law by liberty of contract for payment in one of the metals, without which liberty, indeed, it would be as well to have only one standard, since it is certain that the debtor will always choose to pay in the metal that has become relatively cheaper. In countries where silver is the sole standard, the par of silver to gold may be 15 to 1, or 16 to 1, as law or custom may have established; but in foreign *E.* the par of silver to gold cannot be fixed at any absolute point by the law of any one country, and in the case of a depreciation, say of silver, even though temporary, by which the market price of silver to gold became 17 to 1, a proportionate addition would be made to the figures of the mint or former customary par, and this new sum become practically the par of *E.* between the gold currency of the U. States and the silver dollars of Mexico or rupees of India. Thus, having gold and silver to deal with, it is always possible, whatever may be the variety and names of the coins of different countries, to estimate the equivalents of the one to the other. This is a matter simply of weight and assay; and the ratio thus found is the par of *E.* between one country and another. — Mr. M'Culloch seems to have thought that the par of *E.* should properly include, not only equivalent weight and purity of the precious metals, but their relative cheapness or dearness in given places. "Thus," he says, "if, because of the expense of carriage, the value of bullion in Great Britain be 5 per cent greater than in San Francisco, 100 ounces of pure gold in the latter would not be worth 100 ounces of pure gold in London, but 5 per cent less; and the *E.* would be at true par when bills for 105 ounces standard bullion, payable in San Francisco, sold in London for 100 ounces." Since this has not been the practice in determining the par of exchange, — the 25.30 of Paris, and the old 109 of New York, etc., with London having been based more or less exactly on equal weights of pure gold for pure gold, — a question is suggested which the following considerations may help to resolve. The 5 per cent claimed from San Francisco is for a relative dearness of gold in London, which can only be overcome by carrying the gold from the one place to the other; but it would be illogical to charge in a bill of *E.* for a transport of specie which it is the express object and effect of the bill to supersede. The merchant in London would be entitled to sell a bill on San Francisco for a sum equal to 100 ounces of gold, and to include the cost of *E.*, if any; or his debtor in San Francisco might buy a bill on London for a sum sterling equal to 100 ounces of gold; and if the course of *E* were such that this bill cost him only 99 ounces, the merchant in London would yet have no reason to complain. If neither of these modes of settlement were available, the debtor in San Francisco would have to send 100 ounces of gold to London, in which case there would be no rate of exchange in question.

But, apart from the less value of bullion in some countries than in others, owing to nearness to the mines or other causes, there is a cheapness of the metallic money, as well as the general currency of a country, which operates directly on the rate of *E.*, and requires in one form or other the recognition of a different par from that established under other conditions. The standard may be tampered with; the alloy may be increased; the weight of the coins may be diminished and diminished till, like the Turkish piastre, they become scarce a shadow of themselves. It is obvious that innovations of this kind compel a rectification of the estimated par of *E.* In other cases coins are legitimately changed; and these variations, in so far as they supersede or modify coins which entered into the par estimate, are bound to have a new rating. A country which allows its coinage to be much worn, defaced, and generally light in weight is in the same position as one which has deliberately lowered its standard of value; for though its light coins, when sent abroad, which they are not apt to be, count for no more than they weigh, there is the other and more serious effect that they may have been already well weighed at home, and have so raised the prices of the goods of the country as to place all dealings in them under a delusion as to their real value. One may well believe, however, that this is a form of monetary evil which has now passed away. There will always be some more or less worn and light coins in a metallic circulation, and as long as these are limited in number, and circulate in the country of their coinage at the mint price, they do little or no harm. There is a much more convenient process by which to cheapen the money of a country than any form of debasing the coinage, namely, to dispense wholly or almost wholly with metallic money in favor of an inconvertible paper currency. — When a country is impelled to issue paper money not payable on demand in gold or silver, its monetary value slips away from all fixed reckoning. The first effects are so agreeable as naturally to lead to a larger and a still larger issue, and the agreeable effects are prolonged until the real situation begins to be disclosed, and, finally, derangement has spread so widely on all sides that extrication becomes a task of the gravest difficulty. The effects even on the foreign *E.* are for a time somewhat illusive. There being no more need for gold and silver, nearly the whole stock of bullion passes out, and like a new-found capital gives ample power of purchase abroad. The importer, finding that there are increasing prices for every commodity in the paper money, goes into his business with new heart and will. The premium, which has

early begun to be established on foreign bills, soon becomes so large that the exporter imagines that he can make a fair profit out of the premium on his foreign bill alone, though there may not be a margin of a fraction of one per cent of profit in the actual trade. Supposing such a result possible to the exporter, it is clear that he makes his profit entirely out of his neighbor the importer, who has to buy his bill, and consequently to pay the premium. Both cannot be right in their views, and in point of fact both are wrong until they begin to realize that the inconvertible paper dollar, rouble, or florin is not so valuable and has not the same purchasing power as the metallic money, or as the paper notes maintained in a constant practical convertibility. This fact is demonstrated within the country itself by the more or less gradual and uniform, but inevitable, rise of prices of all commodities, and of bullion among others, in this new currency. It is discovered very early in the foreign *E.*, not only since there is likely to be an excess of imports over exports when a country is in the act of denuding itself of specie, but because the foreigner has to be careful to get the value of his goods or produce as it is known to him in his own money; and any important change in the money of a country, therefore, obtains a sharp valuation abroad. Both at home and abroad it is soon discovered that the par of *E.*, as formerly established, has passed away, and that a new par has come into operation under the pure force of the natural relations of the case. The importer finds no advantage from the advancing prices of what he imports in the domestic markets, since he has to pay more of the domestic money for the foreign bill of exchange by which he discharges the debt for his imports; and the exporter finds no advantage in the premium on his foreign bill which he sells to the importer, since it only replaces what he has already paid in the increased cost of his commodities and other outlays. This action of *E.* is now so familiar as to require no illustration. — As long as a change in the par of the money of two countries is not recognized or clearly understood, there may be much miscalculation and irregular profit and loss among the merchants on both sides. On the other hand, as soon as noted and brought under generally acknowledged estimate, it does not interfere, *per se*, with the movement of produce or the fair profits of those engaged in foreign trade. But how is the depreciation of an inconvertible paper currency to be measured? As a convertible paper currency only maintains its par with gold by being always payable on demand in the gold it promises to pay, so an inconvertible paper currency falls just so much below the par of gold as the difference between the amount of gold it professes to be and the amount of gold it exchanges for in its own market. The price of bullion in an inconvertible paper currency rises like that of other commodities, — not, indeed, in its general market value, but in its market price within the sphere of the currency, and the amount of this rise marks what may be called either a discount on the paper money, or a premium on the gold, and this discount or premium becomes a measure of the depreciation of the currency. It is by no means a satisfactory standard, for it may vary from day to day, and in this respect be as unlike as possible to a par of *E.* between the gold and silver moneys alike of small and great states, which may hold good without variation for any number of years. There may also be restrictions on the sale of bullion, prohibition of the sale of bullion, and speculative combinations of paper-holders and gold-holders to "corner" each other, and the fluctuations may be not only constant but sometimes extreme. But, with all its disadvantages, the relation of gold to the paper money, as it happens to be revealed in the markets, is the only measure of the depreciation to be had, and the premium on gold has consequently to be reckoned as a necessary component part of the rate of *E.* with other countries. — The effect of issues of inconvertible paper money, or the suspension of cash payment of paper currency already in circulation on the par of *E.*, is the same as that of a change of the standard of value, a debasement of the coinage, or, where in one of the two countries the money is gold, and in the other silver, a depreciation of one metal as compared with the other. When two countries par their gold coins, the object is to arrive at a common term by which value for value will be paid, in equivalent weight and purity of metal, out of the money of each other. When one of them displaces its gold coins by inconvertible paper money, the same object has to be attained, and this is reached, though not so fixedly as in the par of metallic coins, by the premium which gold commands over the paper money in the sphere of its currency. The former par, in such cases, may be adhered to as a landmark, and this gold premium may be treated as nominal premium on one side and nominal discount on the other; but it is substantially of the nature of par of *E.*, and becomes a necessary integer of the rate of *E.* In the case of countries of one of which gold, and of the other silver, is the standard money, the nominal par is subject to variation from changes in the relative market value of the two metals. If, for example, the relation on which the par proceeded was 15 ounces of silver equal to 1 ounce of gold, and the depreciation of silver becomes such that 17 ounces will buy only 1 ounce of gold, the par of *E.* between the two countries will follow the course of that depreciation. — The course of the *E.* of India has been much affected of late years by the depreciation of silver, and so, also, those of all silver-paying countries. The drawer of a bill sterling on London in Calcutta or Bombay is literally selling gold for silver, and, whatever the more ordinary par may have been, is bound to take into account the market value of silver. In 1876, owing to the large quantity of demonetized German silver thrown upon the market, less directly to a pre-existing cause, namely, the large extent to which silver had been cast out even of the fractional currency of countries largely committed to inconvertible paper, and also to exaggerated reports of abundant increase of production in the American mines, silver fell to 47*d.* an ounce, about the lowest point reached in its relation to gold, and a great reduction from what had long been its par value of 5s. 2*d.* an ounce. The consequence was that the Indian rate of *E.* declined to 1s. 6¼*d.* per rupee in six months' sight bills on London, or, in other words, that the rupee, having an accustomed par value of near 2s., was worth only 1s. 6¼*d.* sterling, *minus* say seven months' interest accruing between the date and the maturity of the bill. It is difficult, or rather impossible, as foreign bills are negotiated, to distinguish the respective force of the various causes operating on the rate of *E.* In the case of India, nearly all the constituents of *E.* are adverse to the value of the rupee, save that of rate of interest, which is higher in Calcutta or Bombay than in London. The Indian drawer of a six months' bill on London would lose more by holding the bill till its matu-

rity than the buyer of the bill who remits it to London for acceptance and discount; and some middle term must be struck between them, according as the rates of interest in India and England vary. But, on the other hand, India is a country where the imports always exceed the exports, where foreign capital in many forms has been largely invested and has to render its annual tribute, and where the financial relations of the government of India and the government of England are such that the latter has to draw periodically a considerable amount of bills on the Indian treasuries; so that, whatever the par of gold and silver might be, the supply of bills on London would always be less than the demand, or, in other words, the Indian creditors have some advantage over the Indian debtors of London in the rate of *E.* Were gold the money of India, the range of the premium thus established on the bill on London would be limited by the cost of remitting gold; but silver being the money of India, the action of the premium itself, or rather of the relative indebtedness of which it is the result, is to extend the range of the specie limit by lessening the demand for silver abroad. The rupee being less valuable than it formerly was does less work in the Indian circulation, and is all the more needed at home; to export it in payment of the adverse balance of trade, would be to send it where it is less valuable still. It may thus be concluded that the depreciation of silver has been much the most potent and constant element in the adverse current of Indian *E.* The price of silver having since 1876 risen to 53¼*d.*, the rate of six months' bills in London has risen to 1*s.* 8⅝*d.* The rate of Indian *E.* rises in the export seasons, when the supply of foreign bills is increased; and it rises with the price of silver at all seasons. — In the silver *E.* between Hamburg and London the same rule prevailed. In Hamburg silver was money, but in England and other countries, which have a gold standard, it is only merchandise; and a rise or fall in the price of silver affected the value of a bill on Hamburg, or a bill drawn on Hamburg in English sovereigns. Where a double standard exists, as in the U. States and France, bills between one of these countries and another are drawn in the standard which is common to both. Thus, in the direct *E.* between New York and London, the bills are usually or almost wholly gold bills. — 2. *Supply and Demand of Bills.* Were there a common international money, the supply and demand of bills would be the chief determining cause of a rise or fall in the rate of *E.* Hence, in distinction from the nominal par, the relation of supply and demand of bills has been called "real *E.*" Mr. Goschen speaks of it as "the primary element in the value of bills," which, from so practical an authority, may be regarded as indicating that, notwithstanding all the varieties of money, this continues to hold the chief place in the negotiation of bills of *E.*, or that, the nominal par being once determined, or a common principle formed for its rectification when the money of a country has depreciated, it ceases to require the calculation which must always be given to the supply and demand of bills in the market. As the sum of the bills offered, and the sum ready to be bought, never express the whole of the claims upon, or the whole of the debts due to a country, but only such claims as have been drawn for, and debts the time of payment of which has come, or is nearly approaching, there is always more or less change of the relation of supply and demand, as well as opportunity of judgment as to the probable course of the market, and means of applying correctives if the balance be swaying too much on the one side or the other. If the price of foreign bills be depressed for want of buyers, drawers may hold back a little; on the other hand, if the demand has raised the price of bills, all who have sums to draw for will be induced to take advantage of the market, and so increase the supply. The buyers are moved in the same way, quickening or delaying their purchase within the limits of their period of remittance, according to their judgment of the probable course of the *E.* But the buyer cannot delay beyond the day when his remittance is due in the foreign country, nor the drawer beyond the ultimate date of drawing, or his own need of realizing the value of his bill; so that, amidst this oscillation, it is always the peremptory business to be done that determines the effect of supply and demand on the rate of *E.* The debtors of a foreign country, finding the supply of bills on that country less than the demand, will be ready to give an addition of price for them, in proportion to the scarcity, within the cost or up to the cost of remitting specie; and the creditors or drawers on a foreign country will submit in the other extremity to discount on their bills within the cost of sending them to their correspondent or banker's correspondent abroad, with orders to take payment and remit the proceeds in specie. When the course of *E.*, as thus pursued from week to week, reveals that the claims immediate and maturing upon any country are greater than the debts due to it, and cannot be discharged through the mechanism of direct and indirect bills of *E.*, its balance of debt can only be paid by remittances of bullion, or an increased export of goods and produce, or other exportable value. It is unnecessary to dwell further on the law of supply and demand of bills, which differs little from that of other commodities, beyond remarking that an inadequate idea would be formed of the efficacy of bills of *E.* in liquidating international debts without taking into account an immense banking organization, aided by bill-brokers and dealers in foreign *E.*, who have all the main currents of indebtedness under their eyes, and know with the precision of practice how the debts of one centre can be met by its claims upon others, and a stupendous mass of conflicting operations, ordinary and extraordinary, be most economically effected. Fifty or a hundred millions sterling, as in the case of the French indemnity to Germany, can be transferred from Paris to Berlin at a time without material disturbance of the more ordinary business of *E.* When England is lending ten millions to India, fifteen millions to the Australian colonies, or so many millions to Russia, Turkey, or the River Plate republics,—or making several of such loans at nearly about the same time, as has sometimes happened, — the effect on the foreign exchanges, though considerable, is seldom thought of. A foreign loan is usually taken out, — a large part in goods, another part in bills, and the balance most probably in specie. But the effect of a foreign loan on the *E.* is exactly the same as if the borrowing country had exported produce to the lending country equivalent to the amount of the loan, placing it in debt to that amount. The lender has become bound by contract to pay so much to the borrower. The whole weight of a foreign loan, therefore, falls at once to what may be called the adverse *E.* of the lending country or the favorable or less unfavorable *E.* of the borrowing country. The reverse action comes in half-yearly or yearly rills, when the interest and redemptions of

the loan, spread over a series of years, are payable. A foreign loan, if prudently and honorably conceived, may thus, as regards even the rate of *E.*, be advantageous on both sides. The lending country gives a great advantage at once to the borrowing country in its *E.*, which may be no evil in itself, and which the borrowing country, if the terms of the loan be fulfilled, repays in a period of years, during which its exporting and paying power may be reasonably expected to increase, which may be a common good. It may be added that foreign loans and investments of capital in foreign countries, badly as many may have been conducted, yet in their product of sound and marketable stocks and shares come to play a generally useful part in the rates of *E.* The value of commercial bills might not be so equable between such centres as New York and London, or New York and Paris, without the intervention of stock-*E.* securities. — 3. *Rate of Interest.* It is obvious that the number of days or months a bill has to run before payable imports the question of interest as an element of valuation in the rate of *E.* The usance of foreign bills is extremely various, from short to long, from payable at sight to payable at six months after sight; and days of grace are allowed by the law or custom of some few countries considerable enough to be taken into count. Where a bill is payable so many days or months after sight, the time that must elapse, in the ordinary course of communication, before it can be presented for acceptance, is a further prolongation of the currency of the bill. The buyer takes it with this weight of time upon it, and, whatever the period may be, is entitled to a concession equivalent to the interest of the money which he pays, the converse happening in the case of stocks and shares on which dividend or interest has accrued at the period of sale, and must be accounted for to the seller in the price. But the important question in foreign bills of *E.* is what rate of interest is to rule in the transaction. Is it that of the country where the bill is drawn, or the country where it is payable, or a compromise between the two? The drawer, in offering to transfer his bill to a buyer, is wholly in the domain of the rate of interest in his own market. If he sells, he gets the value of the bill in money worth so much interest; and if he holds the bill till its maturity, or to some period nearer its maturity, he deprives himself of money for that period worth the same interest. The buyer who in the event of an *E.* pays down the value of the bill in money would seem to be under the same condition; but in reality, when closely examined, the relations of the buyer and the seller of a bill of *E.* to the rate of interest are different. The buyer has a debt to pay in the country on which the bill is drawn, which debt he is bound to pay now; and for his purpose the bill is all the more valuable the less weight of interest it bears, or, in other words, the less discount it is subject to. Supposing, therefore, the bill is drawn in a country where the rate of interest is 7 per cent on a country where the rate of interest is 3½ per cent, possession of the bill will be more profitable, as regards rate of interest, to the buyer than to the seller. If the seller holds the bill, it bears 100 per cent more weight of interest than it would bear in the hands of the buyer. If the rates of interest in the two countries be exactly reversed, the bill bears 100 per cent more of this weight in the hands of the buyer than of the seller. Thus, after the par of the currencies has been established, which, as we have seen, is always practically established, even in the case of an inconvertible paper currency, by the bullion test, and must be regarded as the first condition of all foreign *E.*, this question of interest is sufficiently important to modify the action of supply and demand, and of other circumstances operating either to raise the rate of *E.* above or depress it below the par of the currencies. It is one of those innumerable commercial relations in which there is an advantage to buyer or seller, but which cannot be realized without mutuality, and which consequently helps them to a transaction. If the advantage of rate of interest be in favor of the buyer of a bill of *E.*, he will be inclined, other elements of valuation considered, to give a somewhat larger price for it than if this were not in the account; and if the advantage be in favor of the seller he will be less exacting. The whole advantage on either side may not be realized in the actual terms in either case; but it will have had some effect towards a mediation of prices. — The price of a bill, apart from other elements, is the sum of the bill *minus* the interest it bears at the rate of discount in the country where it is payable. Yet in the practical negotiation this does not hold exact, because the value of the bill to the seller or the buyer is always modified by the relation of the rate of interest where it is payable to the rate of interest where it is drawn. — Rate of interest, though in the aspect it presents to the seller and buyer of a bill thus plain enough, yet comes to play so great a part in the general course of *E.* that it is worth while to pursue the subject a little further. Rate of interest regulates the supply and demand of bills, and affects the rate of *E.* through that element; where the balance of indebtedness is against a country and advance of the rate of interest tends to restrain imports and to stimulate exports, by which effects the balance of debt is reduced; and where the action of trade is not sufficient to overcome the evil, further rises of the rate of interest may be employed to attract imports of foreign capital and specie. In the case we have supposed of two countries, where the rate of interest is 100 per cent more in the one than the other, this relation of their rates of interest may be normal relation from the greater abundance or the greater profits of capital in the one than the other, and their *E.* may be supposed to be in equilibrium, so that this normal relation is not disturbed by any changes of rate of interest to correct the supply and demand of bills, or the balance of trade. The effect, as we have seen, of difference of interest was in favor of the price of the bill drawn by the country of high interest on the country of low interest, from the fact that the buyer was moving the bill out of a market where it bore a weight of 7 per cent to one where it bore a weight of only 3½ per cent interest. But suppose that the balance of indebtedness has become so adverse to the country of low interest that the rate has been increased to 7 per cent in order to improve the course of *E.*, and that the effect has been to render the foreign drawer less eager to sell his bill, and the foreign remitter more eager to buy it. The remitter or buyer will find the new influence thus introduced operating in the same direction, — viz. in favor of the price of the bill; but, on the other hand, the difference of interest has disappeared. Two effects have thus proceeded from the same cause, which neutralize each other so far as they go; and the remitter, instead of buying a bill, may as well, as regards the rate of interest in the two countries, be drawn upon by his foreign creditor. If the rate of interest be further increased to 10 per cent,

the drawer may be induced to hold the bill in order to save the 3 per cent of discount above the rate of interest in his own market; or an investing buyer may intervene, and give such a price for the bill as will allow the seller 1½ or 1 per cent of the profit, and leave 1½ or 2 per cent to himself. In either case the bill would be held till it matured, and relief to that extent be afforded to the *E.* of the country raising its rate of interest. But it is clear that not until the rate were raised 3, 4, or 5 per cent above the rates of the countries drawing upon it could any effect of this kind be produced. It thus appears that the function of rate of interest in controlling the supply and demand of bills is a strictly limited function; and this limitation will probably be found in all the effects expected from it on the state of *E.* It may hasten the course of payments due to a country, but it does not lessen the adverse balance of indebtedness, nor can it much retard the pressure of the foreign claims. It may restrain importation of foreign goods, but it may not at the same time increase exportation of domestic goods; or, if increasing export, it may not diminish import. These are results which will depend on many other causes. It may tend to lower prices, and thus seem to check import to the cost of production and exchange; it may render much outward as well as inward trade less possible. If the rate of interest be carried high enough; it may attract much capital from neighboring countries. Foreign bankers and lenders will buy up bills on the country as the best mode of importing their capital, or may import specie; and admirable as this service may often be, yet it does not lessen the foreign indebtedness of the country. It only transmutes one form of the adverse balance into another more convenient for the time being, and, in the mean while, if the high rate of interest has crippled the productive and exporting resources of the country, little good or a reverse balance of evil may have been done. Hence, bullion reserves are either inadequate in the plan of their formation, or they miss their use and efficacy if, when a heavy balance of indebtedness appears in the *E.*, they cannot be trenched upon without large and excited advances of the rate of interest. — 4. *Cost of Specie Remittance.* Nothing is more definite in the system of *E.* than what has been more than once stated in the course of these remarks, namely, that the cost of remitting specie forms the limit of variation in the rates of bills. That the buyer of a foreign bill will not give more for it than the cost of remitting specie equal in amount to his foreign debt, is an axiom which holds good under all the ordinary conditions. But there are exceptions to the rule where the conditions vary from the ordinary. From the countries of productive gold and silver mines bullion flows abroad as naturally as the corn, cotton, wine, or oil, which forms the special merchandise of a country, and it will so flow irrespective of supply and demand of bills, rate of interest, and other causes which have so much sway in rates of *E.* San Francisco will export gold and silver to London in all states of supply and demand of bills, and when its rate of interest may be double that of the Bank of England, and in the common parlance money is there dearer than in London, though it may be only that the average profits of capital are larger in the one place than in the other. If bullion is needed at New York, and commanding a higher premium on the national currency, it will be matter of calculation to the bullion exporter at San Francisco whether to send a consignment to New York or to London. If, since the discovery of the California mines, a metallic currency had been established throughout the United States, they would no doubt have absorbed a proportion of the gold and silver shipped to Europe; but, this object accomplished, the export to Europe would have proceeded much as it has been proceeding. In short, from gold and silver producing countries the export of bullion is not a remittance of money, but a transmission of the exportable produce of labor, which but for export would not have been produced. Then, there is the case of *E.* between countries of silver standard and countries of gold standard, from either of which remittances of specie cannot be made without exact reference to the market value of the two metals. This will have been already marked in the par of *E.* between the gold and silver country, but it will have introduced a new element into the cost of remittance, since the specie remitted will have to be sold into the specie standard of the country to which it is remitted. — In exchange between a gold-paying and a silver-paying country, one of which, say the silver country, has gone largely into an inconvertible paper currency, the case becomes more complicated, and the specie limit to adverse rate on bills recedes, till, if the inconvertibility be so great as to be incapable of valuation, or the government in its ignorance or alarm has prohibited the export of specie, the limit is wholly lost. A Russian merchant, who has ample silver and paper roubles at command for his purposes, but has a debt to discharge in the U. States, or needs to lift a cargo of cotton at Liverpool or of sugar at Glasgow, and finds that the remittance even of such specie as he may be able to produce is illegal, must buy a foreign bill or a banker's draft on London at any price. At this stage the rate of *E.* passes out of the domain of principle, or natural action of principle, into that of purely arbitrary considerations. When, from much less sufficient causes, general discredit passes upon a country, the rate at which its bills or acceptances may be valued is scarcely more reducible to rule. It might even be difficult to define why, in the same general circumstances, there should be collaterally a higher and lower course of *E.*, and the bills drawn or payable by one firm should differ in their rate from those drawn or payable by another firm. It is only by removing abnormal conditions that one arrives at the underlying principle which governs *E.* and determines the success with which it is conducted. — Accordingly it is in countries where bullion, separated from its necessary export from the mines, has become money, and forms the common standard of value in their international trade, that the limitation of the rate of *E.* by the cost of specie remittance is most clearly visible. Between all nations trading on a gold basis there is a well-known and definite point above and below the par of *E.* where it becomes profitable to move gold from one to the other, and which marks the extreme range of variation in the price of bills. Thus in the exchange of London with Paris, New York, and Berlin, respectively, 25.10, 4.81, and 20.30 mark a point in the price of bills below par when it pays to send gold from London to these centres; and, on the other hand, 25.30, 4.87, and 20.50, a point above par when it becomes profitable to move gold from Paris, New York, or Berlin to London. — When the rate of *E.*, touching, under the supply and demand of bills and other elements of valuation, these extreme points on one side or the other, and tending to exceed them, is the result of an actual over-indebtedness, a transmission of bullion

is the best and most satisfactory mode of settlement. It directly reduces the balance of debt, and renders the price of bills again more equitable to traders. All other modes of fencing it off, save an increased export of goods and produce, are more or less illusory. If, in such a juncture, an amount of foreign capital has been invested in bills on the country with the view of holding them to maturity for sake of profit in rate of interest, and now, with the view of realizing the value of the bills in gold, they should be pressed on the market before maturity for discount, an advance of one per cent in the rate of discount may be sufficient to induce the foreign capitalists to hold the bills till they mature. And another advance of one per cent in the rate of discount may induce them to reinvest in other bills on the country. But the root of the adverse *E.* will not have been removed. It will always appear when the foreign capital thus invested in bills on the country is from any cause withdrawn, and until the over-indebtedness is liquidated by remittances of specie, increased export of produce, or transfers of salable shares and securities. If, on the other hand, the rate of *E.* has been brought to the specie limit by bills representing no actual debt, but drawn and accepted solely for the purpose of moving bullion, as may probably happen, there is no remedy for what may prove an inordinate demand for specie by irregular means but the detection of the bills, and either refusing them discount, or discounting them under exceptionally high rates of interest. — 5. *Correct Judgment, or its Opposite, Panic.* An exposition, however brief, of the causes operating on the rate of *E.* would scarce be complete without including the effect of opinion or estimate, correct or erroneous, of the probable course of the market; and therefore it may be observed that a judgment has to be formed in every new phase of the numerous fluctuations. The seller of bills finds that within a few days the market has taken an unfavorable turn. If he judges that this has arisen from merely accidental or temporary causes, he will be inclined to hold his bills for what he deems their true value; or if, on the contrary, he judges that the causes operating are more deeply seated, and likely to become stronger for a time, he will sell with the least possible delay. Should his judgment be justified by the event he will have done what is right for him, if otherwise he will have done what is wrong; but in either case his abstention or action will have affected the supply and demand of bills in the mean while. In all the great marts of *E.* there are frequent wave-currents, so to speak, which cannot be rightly interpreted either as the sign of a protracted state of *E.* between the points of the compass in which they flow, or of the general foreign indebtedness of the centre upon which they are directed. When New York balances its debts to China and India by bills on London, the bills affect the course of eastern *E.*; but they lose much of the significance they might otherwise bear when it is considered that New York is in course of compensating London in other directions. These operations come to be understood and systematized by dealers and agents in bills with much accuracy; but in addition to the judgment that may be formed by a thorough analysis of the substance of the various currents of *E.*, there is the effect of opinion on external events, which, though of almost daily occurrence in one quarter or another, are wholly of future account, and which impress not only the connoisseurs of *E.*, but the whole body of drawers and remitters, from whom the original impulse on the action of *E.* in all cases comes. The examples that might be adduced of the great effect of passing events on *E.* are innumerable. In the beginning of 1861, when the rupture between North and South had occurred, and war was imminent, the U. States had a most favorable balance of trade with England and Europe. Their exports of wheat and flour and cotton in the previous year had at once reached a maximum in quantity and a rise in value. The drawer of a bill on London was in so good a position that he had only to wait for the buyer to get the value of his bill up to the specie point. But so eager were the drawers, in view of the pending outbreak of civil war, to realize what was owing to them abroad, that they threw their bills on the market in an abundance which reduced their price to the other end of the scale. This, of course, had its converse effect at London, and bills on New York were there selling at such a premium that it seemed as if the U. States would have to remit bullion to Europe. The volume of bills, however, told its own tale after a while. England had to remit bullion in large quantity to the U. States, and then people began to awake to the perception that, in the *E.* transactions, the one element most important of all had been left out, — namely, the relative indebtedness. It must have been a time of much profit to those on both sides of the Atlantic who knew the actual state of affairs, and of much loss to those who did not know, of whom there can be little doubt that the latter were much the greater number; but the balance of value between the two countries, as expressed on the face of the bills, had to be rendered all the same. To take a more recent case. The *E.* value of the Russian rouble during the last twelve months of war between Russia and Turkey will amply illustrate what is meant by the prevailing judgment on events in their future aspect, which, while proceeding on a certain amount of reason, yet borders on panic, and may be of the nature of panic. The issue of paper roubles had gone the length of 730 millions before the war, and there was a constantly increased remission during the year, counteracted in some measure by conversions into loans bearing interest. On the mobilization of the troops the value of the rouble was 58 cts. to 60 cts.; on war being declared it fell to 54 cts.; when it seemed as if Plevna could not be taken it sank to 45 cts.; when Plevna fell it rose to 53½ cts.; and when it followed that the conquest of Turkey and an armistice did not end the difficulties, it fell to the lowest point it had touched, 44½ cts. — *Favorable and Unfavorable E.* The term, "favorable *E.*," as commonly used, not only means a state of the *E.* when the debts due to a country abroad are so much greater than what it owes abroad as to affect potentially the demand and supply of bills, and when the money of the country so situated, as expressed in the price of bills, is equal to more of the money of a foreign country than the nominal par, — when its bills on abroad, in short, are dull of sale, while the foreign bills on itself are in much demand; it is also applied to all stages, moderate or extreme, of this relation of the foreign *E.* And so the term "unfavorable," of course, applies to the opposite conditions. If these phrases had ever any reference to the prosperity of the foreign trade of a country, they must have arisen under the sway of "the mercantile system" of the last century, the principle of which was that a balance payable in specie is the cardinal condition of prosperous trade with any foreign country; or, if introduced under that erroneous theory, they have

been prolonged by the usage of bankers and other dealers in foreign *E.*, who, having large liabilities entailing bullion payment, naturally consider a state of *E.* which is on the eve of bringing specie more favorable than one on the eve of taking it away. This is quite true in the monetary view of the question, and it is true also as to the relative indebtedness for the time being. But it is not true to extremes, even in a monetary sense. The condition of a country to which specie was always flowing in and never going out would be a realization of the fate of Midas. The most favorable *E.*, therefore, is that where there are only moderate oscillations up or down from the par of *E.* While the terms "favorable" and "unfavorable" are thus somewhat misleading as regards substantial interests, they are involved in a minor technical complexity, which, though well understood by those in the business, may here be stated. The terms would be strictly applicable in the sense they are used, were the rate of *E.* always quoted in the home money. The *certain* properly in *E.* transactions is the number of pounds, dollars, francs, or florins a remitter has to pay abroad; the *uncertain* is what amount of his own money is equal to this amount of the foreign money. Were the quotation on both sides respectively always made in the home money, the fall or rise of the quotation would always be identifiable with such terms as "favorable" or "unfavorable." Both drawers and remitters would be so familiar with their significance as to know what they meant. But this is not the practice, and, with so much variety of currency, could hardly have been the developed practice, of *E.* The pound sterling of England is the largest monetary unit, and there is always facility of expressing minute shades of difference in the smaller units, more especially when, as in the case of Paris or New York, they have a decimal character. In London, consequently, the public only hear quotations of rate of *E.* with such countries as France and the U. States in the foreign money, — London thus giving what is called the *certain*, and the smaller moneys the *variable*. On the other hand, not only in the Australian and other British colonies, where the standard of value is the same as in the parent country, but in such large commercial regions as China and India, the quotation of rate of *E.* on both sides is always expressed in sterling. The Chinese tael of silver is worth so many English pence sterling at Canton; and the rupee is worth so many English pence at Bombay or Calcutta; and in the same terms run the quotations in London. The practice may not alter in any iota the true rate of *E.*, but it has the result that when the rate is quoted in sterling money, as in the Indian, Chinese, and Australian *E.*, every drop in the quotation is "more favorable" to England, every rise "less favorable," and this will hold good whether the quotations are made in England or in India, China, or Australia; whereas, on the other hand, when *E.* are quoted in other money — American, French, or German, etc. — every drop in the rate by the same rule is "less favorable," every rise in the rate "more favorable," to England, whether the quotation be made in England or in the foreign countries. The states of *E.* to which the terms "favorable" and "unfavorable" are thus applied refer wholly to the effect of the demand and supply of bills; so that, since the fluctuations of *E.* are due to various causes, it would be an improvement were the quotations always to include the par of *E.*, whether between the gold money of one country and the silver money of another, or between either and inconvertible paper, the depreciation of which has to be determined by the gold or silver premium in the country of its currency. The actual rate above or below par would show the effect due to the supply and demand of bills. When a sudden alteration takes place in foreign *E.* nothing is more difficult than to discover the relative force of the cause or causes to which it is to be ascribed, and yet nothing is more necessary to know than this, whether in the correctives that may be applied or in the lessons to be conveyed to importers and exporters.

Negotiation of Bills of E. Rates of *E.* have undergone much variation of late years from changes of standard, — in some cases from gold to silver, and in others from silver to gold, — and from the circulation of forced paper currency. The tendency, however, is to greater uniformity. The gold standard of value adopted at Berlin extends to the whole German Empire, and the rates of *E.* are now calculated in imperial marks and pfennige at Hamburg, Frankfort-on-the-Main, Altona, and other German places, where different moneys formerly were used. The money under the new system is 100 pfennige = 1 mark, 20 marks = 1 twenty-mark gold-piece (imperial mark) = 19*s.* 6.954 sterling mint par. The mark, which is the unit or integer of the system, is a silver coin based on the ratio of 1 to 15½ as the relative value of silver and gold. In like manner the kingdom of Italy has extended a uniform *E.*; and the rates at Naples, Palermo, Messina, Milan, Turin, Florence, Leghorn, and other Italian towns are similar to the rates at Genoa. — Bills of *E* on New York and in other large cities of the U. States are bought and sold through brokers, who go round the mercantile and banking houses, and discover whether they are buyers or sellers of bills. In New York, as in other great commercial cities, bankers deal largely on the rise and fall of *E.*, — buying bills when they expect a rise, and selling bills when they expect a fall. — *E.*, as regards the abundant arithmetic to which it gives rise in its negotiation, may be divided into (1.) Direct, or *E.* between two countries wholly based on their rates of *E.*, which is so simple as to need no remark; (2.) Cross, or *E.* between two countries in which a third country has an interest, as when London, say, has 10,000 francs in Paris which he wishes to move to Hamburg, and has to take account of his own course of *E.* to Hamburg, as well as the direct between Paris and Hamburg, which is only less simple than direct exchange, inasmuch as it requires two formulæ instead of one; and (3.) Indirect or arbitrated, where *E.* between two countries is conducted through the medium of a third, or more than one other country, and thus becomes more compound as the sphere of the operation is extended. It is an arbitrated rate because it has no actual form, and is found only in figures out of the current rates of *E* between more than two countries. The object being to discover how a debt in one place may be most economically paid from another, the question carries along with it not only the difference between remitting and drawing which exists in the simplest direct *E.*, — the debtor in the one country and the creditor in the other having always the option of the one remitting or the other drawing, — but such *minutiæ* as whether the rate of *E* given be in the foreign money or in sterling, till it results in the following rules: —

"*For Remittances:* —

"With a foreign rate, any arbitrated rate is better than the direct rate if it is *greater* than the latter.

"With a sterling rate, arbitrated is better than the direct rate if it is *less* than the latter.

"Because, in either case, a given sum in sterling will produce a greater sum in foreign money, or a given sum in foreign money will cost a less sum in sterling.

"*For Drafts or Returns:* —

"With a foreign rate, any arbitrated rate is better which is *less* than the direct rate.

"With a sterling rate, any arbitrated rate is better which is *greater* than the direct rate.

"Because, in either case, a greater sum in sterling will be obtained from a given sum drawn for in foreign money."

Nor is this all. Arbitrated rates are calculated for present money: the actual rates of *E.* on which they are calculated have been affected by time and rate of interest. In the rate of direct *E.* particularly, with which the arbitrated rate has to be compared, this effect has to be estimated, long bills reduced to short, and the difference of interest on them discounted from the basis of calculation *prima facie*. This, in a superficial view, may be counterpoised by drawing speculative bills of long date on a foreign centre; but there are limits to drawing on a place for purposes external to its ordinary course of *E.*, and a large amount of bills thus directed without corresponding remittances might produce an effect on the *E.* which would go far to upset the calculation. — It is obvious that arbitration of *E.*, thus burdened at every additional length of the chain by difficulties of estimate, cannot be much extended, or become too artificial, without the risk of miscarriage. But the mediation of direct *E.* through a third place is of such com-

mon and useful practice that it may be desirable to give an example broad enough to illustrate the general method of equation.

Take London on Paris at 3 months, quoted f. 25.55; Paris on London at 3 months, quoted f. 25.10.

The discount for 3 months, in the example to be given, is taken at 1 per cent, or 25 cen., which is deducted from the London rate, and added to the Paris rate, to make the two short or cash rates; thus reducing the former to f. 25.30, and raising the latter to f. 25.35.

EXAMPLE.

From the following rates of bills in London and Paris, it is required to find, —

1st. Whether, having money to transmit from London to Paris, it will be better for me to remit direct bills on Paris, or to order bills in Paris to be drawn upon me in London, at the rate of ½ per cent per annum.

2d. Whether, having money to draw from Paris, it will be better for my correspondents there to make me remittances, or for me to draw upon them.

3d. If I have to make remittances to Paris, whether any indirect rate will answer better than the rates of direct bills.

4th. If I have to obtain returns from Paris, whether any indirect rate will answer better than either of the direct rates.

RATES OF EXCHANGE.

London, June 17.		Paris, June 14.
25.55	Paris at 3 months.	
12''1¼	Amsterdam	209¼
13''10¼	Hamburg	184
121	Frankfort	210¼
29.47½	Leghorn	15 loss = 100 lire for 85 francs.

METHODS OF WORKING THE EQUATIONS.

Amsterdam.

£1 ?
1 — * 12''1¼ Florins and Stivers.
100 — * 209¼ Francs.
Francs 2.09¼ × 12.06¼ = 25.24 Francs.

Hamburg.

£1 ?
1 — * 13''10¼ Mk. and Sc. = 218¼ Sc.
Sc. 1600 = Mk. 100 — * 184 Francs.
Francs 184 × 218¼ ÷ 1600 = 25.10 Francs.

Frankfort.

£1 ?
10 — * 121 Florins.
100 — * 210¼ Francs.
Francs 210¼ × 121 ÷ 1000 = 25.42 Francs.

Leghorn.

£1 ?
1 — * 29.47½ Lire Italiane.
100 — * 85 Francs.
Francs 85 × 29.47½ ÷ 100 = 25.06 Francs.

COMPARISON OF THE ARBITRATED RATES.

	Prices.		Pars.
	London	Paris	
London, 3 months	25.55	....	25.30 short.
Amsterdam	12''1¼	209¼	25.24
Hamburg	13''10¼	184	25.10
Frankfort	121	210¼	25.42
Leghorn	29.47½	85	25.06
Paris, 3 months	....	25.10	25.35 short.

FOR DIRECT PAPER.

It appears from the direct rates between London and Paris at 25.30 and 25.35 that, —

1st. To remit or transfer money from London to Paris, it is better for Paris to draw upon London at 25.35 short, than for London to remit to Paris at 25.30 short, because by the former operation there will be made 5 cents per pound, or about one fifth per cent, more than by the latter.

2d. To have returns from Paris, it is better, by the same 5 cents, for London to draw upon Paris than for Paris to remit to London, because the bills will cost so much less French money, or produce so much more in sterling.

FOR INDIRECT PAPER.

1st. For remittances to Paris, it appears from the arbitrated results that bills on Frankfort, bought in London at 121 florins per £10 sterling, and sold in Paris at 212 francs per 100 florins, will produce 12 cents more than direct remittances from London to Paris, or 7 cents more than is yielded by direct drafts of Paris upon London.

(Continued at beginning of next page.)

PARS OF EXCHANGE IN THE U. STATES.

(Since Jan. 1, 1870, the following rates are taken by the U. States Custom-House in estimating the value of all imported merchandise.)

COUNTRY.	Monetary Unit.	Standard.	Value in U. S. money.	Standard Coin.
Austria	Florin			8 Gulden, or 20 Francs, gold, = [$3.8589
Belgium	Franc	Gold and Silver	0.193	5, 10, and 20 Francs.
Bolivia	Dollar	" "	0.965	Escudo, ½ Bolivar, and Bolivar.
Brazil	Milreis of 1000 Reis	Gold	0.545	None
British Poss. in N. A.	Dollar	"	1.	
Bogota	Peso	"	0.965	
Central America	Dollar	Silver	0.935	Dollar.
Chili	Peso	Gold	0.912	Condor, Doubloon, and Escudo.
Denmark	Crown	"	0.268	10 and 20 Crowns.
Ecuador	Dollar	Silver	0.935	Dollar.
Egypt	Pound, 100 Piastres	Gold	4.974	5, 10, 25, and 50 Piastres.
France	Franc	Gold and Silver	0.193	5, 10, and 20 Francs.
Great Britain	Pound Sterling	Gold	4.866½	½ Sovereign and Sovereign.
Greece	Drachma	Gold and Silver	0.193	5, 10, 20, 50, and 100 Drachmas.
German Empire	Mark	Gold	0.238	5, 10, and 20 Marks.
Japan	Yen	"	0.997	1, 2, 5, 10, and 20 Yen
India	Rupee of 16 Annas	Silver	0.444	
Italy	Lira	Gold and Silver	0.193	5, 10, 20, 50, and 100 Lire.
Liberia	Dollar	Gold	1.00	[tavo.
Mexico	Dollar	Silver	1.015	Peso, or Dollar, 5, 10, 25, and 50 Cen-
Netherlands	Florin	Gold and Silver	0.385	Florin, 10 Gulden, gold, = $4.0190.
Norway	Crown	Gold	0.268	10 and 20 Crowns.
Peru	Dollar	Silver	0.935	
Portugal	Milreis of 1000 Reis	Gold	1.08	2, 5, and 10 Milreis.
Russia	Rouble of 100 Kopecks	Silver	0.748	¼, ½, and 1 Rouble.
Sandwich Islands	Dollar	Gold	1.00	
Spain	Peseta of 100 Centesimos	Gold and Silver	0.193	5, 10, 20, 50, and 100 Pesetas.
Sweden	Crown	Gold	0.268	10 and 20 Crowns.
Switzerland	Franc	Gold and Silver	0.193	5, 10, and 20 Francs.
Tripoli	Mahbub of 20 Piastres	Silver	0.844	
Turkey	Piastre	Gold	0.043	25, 50, 100, 250, and 500 Piastres.
U. S. of Colombia	Peso	Silver	0.935	

2d. For returns from Paris, it appears from the arbitrated results that bills on Leghorn, bought in Paris at 85 centimes per paper lira Italiana, and sold in London at paper lira Italiana 29.47½ per pound sterling, will cost 29 cents. less than direct bills from Paris, and will give 24 cents. more than drafts from London on Paris.

Such is the manner in which the various *E.* are calculated in order to ascertain which will answer best for a speculation in bills through intermediate places. The contingency of a change of rates has to be considered, and the charges of brokerage and commission on the operation have to be deducted from the result, or may be reduced when the operation is done by branches of the same house, or on joint account. The elasticity of arbitrated rates of *E.* is put to the severest strain when a large subsidy, or monster indemnity, like that of France to Germany, has to be paid by one country to another. In these cases it is necessary to employ extensive banking co-operation, and at centres on which the drafts are heavy to arrange means for the support of the *E.* — *R. Somers.*

Exchange, a place of public resort, in commercial cities, where merchants meet to transact business. In New York and other cities of the U. States there are also Corn *E.*, Cotton *E.*, etc. — The bartering of one commodity for another.

Exchange Broker, a person whose business is to propose and conclude bargains between merchants and others in matter of bills of exchange. They make it their business to know the state of the exchange, and the circumstances likely to elevate and depress it. They sell bills for those *drawing* on foreign countries, and buy bills for those *remitting* on them; and from their knowledge of the mutual wants of the one class compared with those of the other, a few of the principal brokers are able to fix the rate of exchange at a fair average, which it would not be possible to do if the merchants directly transacted with each other. They receive a small commission.

Exchange Dealer, a person, more usually a banker, who buys and sells foreign bills of exchange.

Exchange Fire Insurance Co., located in New York City, organized in 1853. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,010; net surplus, $119,693.49; total cap. and surplus, $319,703.49; risks in force, $18,903,772; premiums, $91,139.06; premiums received since the organization of the Co., $2,440,245.98; losses paid, $1,433,239.98; cash dividends paid to stockholders, $242,617.50.

Exchequer Bills are promissory notes issued by the English Treasury under the authority of Parliament; and are the form in which the floating or unfunded part of the English national debt chiefly exists. The issue of these bills greatly facilitates the current financial business of the government. They are circulated at present for sums varying from £100 to £1,000, which are printed with ink of different colors; namely, £100 bills with red; £200, yellow; £500, blue; and £1,000 bills with black ink. They bear interest from their date until the day fixed for their payment, which is announced by advertisement, and is generally about a year after being issued, when they are either discharged or renewed for other bills, at the option of the holders. Parties neglecting to present their bills on the day appointed are deprived of interest till the next opportunity of obtaining new bills, or else must submit to the loss of whatever premium they may chance to bear at the time. During the currency of these bills they may, after a limited time, be paid to the government at par in discharge of duties and taxes; they are thus nearly exempt from the risk of depreciation, and, as they are transferable without the necessity of a formal assignation, they form an eligible investment for capital that may require to be suddenly made available. They are so much in demand by capitalists in the metropolis, that government is enabled to keep a considerable amount of them, generally about £28,000,000, in circulation at a low rate of interest. The rate is fixed at so much per cent per diem, and is commonly adjusted so that the bills shall bear a premium in the market, in order that government may not be exposed to the inconvenience of having them returned in payment of taxes. Of late years the rate has fluctuated from 2½*d.* to 1*d.* per cent per diem; that is, from £3 16*s.* 0½*d.* to £1 10*s.* 5*d.* per cent per annum.

Excise, in England, an inland tax or impost on certain articles of home manufacture and consumption, as on beer, British spirits, malt, etc. The excise also grant licenses for certain trades and occupations which bring in a duty to government. See INTERNAL REVENUE.

Excortication, the stripping off the bark of a tree.

Execution, a judicial writ issuing from some court of law against the body, lands, or goods and chattels of a person.

Executor, a person appointed by the testator to administer to his estate, to carry into force the appropriations of his will and testament after his decease.

Exemplaire [Fr.], a copy of a book or engraving.

Exempt, privileged; free from charge or duty.

Exequatur, an official recognition of a consul or consular agent, authorizing him to act in a country.

Exhibit, any voucher or document produced in a court of law, or before arbitrators, etc. — The written statement of the affairs of a merchant in failing circumstances, or of one who has suspended payment.

Exhibition, a public display of works of art, industry, manufactures, etc. See NATIONAL AND INTERNATIONAL EXHIBITIONS.

Ex-Officio [Lat.], by virtue of the office.

Exotic, a plant or product of a foreign country.

Expansion, all substances, solid, liquid, and gaseous, when chemical change does not take place, expand by heat and contract by cold. In some of them this property occurs in a greater degree than in others, but is constant for the same substance under the same circumstances. The chemist avails himself of this property in the construction of his thermometer; the wheelwright, in fixing on the tire of his wheels; the engineer, in restoring to the perpendicular the leaning walls of buildings, etc. This *E.* by heat is of great importance in the manufactures, as allowance has to be made of it in every purpose where metals are employed. The following is a list of the *E.* of the chief metals, etc., when heated from 32° to 212° F., or from 0° to 100° Cent.: —

Substance.	*Expansion.* In bulk.	In length.
Glass	1 in 384	1 in 1150
Platinum	1 " 377	1 " 1311
Steel	1 " 309	1 " 926
Iron	1 " 282	1 " 846
Gold	1 " 227	1 " 682
Copper	1 " 194	1 " 582
Brass	1 " 179	1 " 536
Silver	1 " 175	1 " 524
Tin	1 " 172	1 " 516
Lead	1 " 117	1 " 351
Zinc	1 " 113	1 " 340

Of the liquids, they expand as follows, when heated from 32° to 212° F., or from 0° to 100° Cent.: —

Mercury	1 in 55 in bulk
Water	1 " 21 "

Gases practically all expand alike; that is to say, for every degree F. a gas expands $\frac{1}{491}$ of its bulk at 32°, and for every degree Cent. $\frac{1}{273}$ of their volume at 0° C. — An example will show the importance of this. Suppose an iron bar, connecting two sides of a building, and of a length of about 85 feet. The increase in length by heat of this bar would make it 1 inch longer in summer than in winter; and it would, if no allowance be made, pull or thrust the walls to this extent each year. The unequal expansion of the metals has received an important application in the *gridiron compensation pendulum*, which is so arranged as to preserve the centre of gravity of the bob or ball at a constant distance from the axis of suspension, notwithstanding changes of temperature. Leroy's Compensation Pendulum (Fig. 168) consists of several rods of steel and brass, so arranged that their unequal capacity of *E.* produces a compensating result.

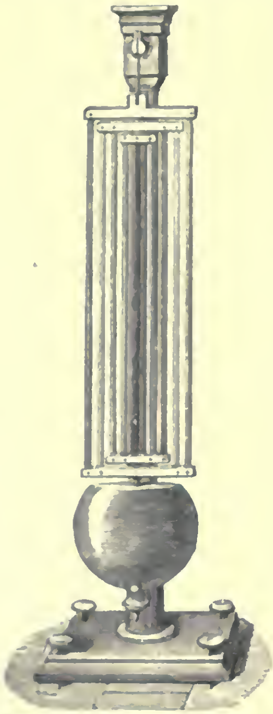


Fig. 168. — Compensation Pendulum.

Expansion-Joint, the stuffing-box joint connecting the steam-pipes, so as to allow one of them to slide within the enlarged end of the other when the length increases by expansion.

Expansion-Valve, an auxiliary valve placed between the slide valve and the steam cylinder. It is worked by a cam or other contrivance, so as to cut off the steam at a given period, and cause the remainder of the stroke to be performed by expansion.

Ex-Parte, a partial or one-sided statement.

Expectation of Life, a phrase improperly applied by writers on Life Insurance to the average of forthcoming years in the life of an individual. As explained in the article Interest and Annuities, it is different from the term of probable life.

Expedient, a contrivance.

Expenditure, a charge or disbursement; outlay; that which is consumed or used on board ship is said to be expended.

Experiment, a trial or effort; an attempt to analyze or determine by a chemist.

Expert, a person skilled in handwritings; a facsimilist. — A person selected by a court, or by parties in a cause, on account of his knowledge or skill, to examine, estimate, and ascertain things, and make a report of his opinion.

Exploitation [Fr.], the improving of lands, the felling of woods, the working of mines, or other undertakings.

Exportation, the art of sending or carrying in traffic goods or productions from one country to another. See Importation and Exportation.

Exporter, a shipper of wares, commodities, or merchandise of any kind to a foreign country.

Exports, goods, wares, or manufactures transmitted abroad. See Importation and Exportation.

Express, a system organized in the U. States for the transportation of merchandise or parcels of any kind. This system was originated in 1839, when Mr. William F. Harnden, of Boston, proceeded to New York in charge of a few parcels, bank-notes, etc., for delivery in the latter city, and for which service he received an adequate remuneration. The success of this experiment led him to form a contract with the railroad and steamboat companies connecting the two cities, by which increased facilities were afforded him for the development of his scheme. In the next year a rival *E.* started under the auspices of Messrs. P. B. Burke and Alvan Adams, which eventually extended its ramifications throughout the U. States, and led the way for the formation of numerous other companies, specified at the foot of this article. The Burke and Adams *E.* became consolidated, in 1854, with other companies, and form the now celebrated Adams' Express Company. The general system upon which these companies conduct their extensive operations is sufficiently well known in this country to dispense with exposition here, even did the limits of our space admit of such. The following are the principal *E.* companies now in successful running, and their field of operations: *Adams' Express Co.* (E., W., and S. States); chief offices, New York, Philadelphia, and Boston. *American Express Co.* (N. and W. States and Territories). *American-European Express Co.* (Great Britain, France, and other parts of Europe, Asia, and Africa); principal offices, New York, Philadelphia, London, Liverpool, Paris, etc. *Central Express Co.*, an important concern, connecting with all others; chief office, Philadelphia. *Havana and West Indies Express Co.*, W. Indies, Brazil, and Eastern S. America. *Harnden Express Co* (N. and E. States); chief office, New York. *Merchants' Union Express Co.* (N., E., and W. States); chief office, New York. *Pacific Mail Steamship Co.*, California, S. and Central America, China, Japan, and islands of the Pacific; Pier 42, foot of Canal street, New York. *Southern Express Co.* (S. States, — all S. of "Mason and Dixon's line"). *U. S. Express Co.*, N and E. States, and the Canadas. *Wells, Fargo, and Co.*, California (overland), and W. Territories and the Pacific islands, etc. — *Zell's Encyclopædia.*

Extension, an agreement by which a creditor allows to his debtor further time for payment.

Extra, additional; superior; a term for the flour made of the best quality of red winter or low white wheat, with the fine flour and middlings bolted out. Double extra, or, as usually written, XX, is the choicest flour that is made from the best white wheat.

Extract, among *chemists* this term is understood to apply to the residuum of the evaporation of aqueous decoctions or infusions of vegetable matter. In *medicine* and *pharmacy*, it has a less definite signification, being applied to various preparations obtained by evaporating the expressed juices, or the decoctions, infusions, or tinctures of vegetable substances, until a mass of a solid or semi-solid consistence is formed. *E.* vary in their nature and composition with the sub-

stances from which they are prepared and the fluids employed as solvents. When water is employed as the menstruum, the products (*aqueous E.*) usually consist of gum, starch, sugar, albumen, extractive and saline and other matter, along with the peculiar principles on which the medicinal virtue of the vegetable depends. When spirit is employed as the solvent, the products (*alcoholic E.*) contain most of the substances above enumerated, except the gum and starch, together with several other substances which are soluble in spirit, but which are either wholly or nearly insoluble in water; as resins, essential oils, and the proximate principles of vegetables. These preparations, with scarcely an exception, are considerably more powerful than the aqueous *E.* of the same vegetables. In some cases proof spirit or underproof spirit is employed, when the extracts (*spirituous E.*) generally possess properties between those of the above. In other cases, dilute acetic acid or acidulated water is employed as the menstruum, when the products (*acetic E.*) possess much greater activity than when prepared with water; and would in many cases prove fatal, if exhibited in doses as large as those of the aqueous *E.* Still more active *E.* are obtained by a combination of the two last menstrua. Ether is sometimes used as the menstruum for the active principles of certain substances, as cantharides, cubebs, worm-seed, etc. (*ethereal E.*). The term *simple E.* is applied to an *E.* prepared from a single plant or vegetable substance, and the term *compound E.* to one prepared from two or more of such substances. The *fluid E* of modern pharmacy are those which are only evaporated to the consistence of a thin sirup, and then mixed with $\frac{1}{10}$ to $\frac{1}{8}$ of their volume of rectified spirit.

Preparation. The preliminary operations in the manufacture of extracts are similar to those employed in the preparation of *decoctions*, *infusions*, and *tinctures*. The proper quantity of the ingredients being taken, the whole is well bruised or reduced to coarse powder, or otherwise divided by slicing with a knife, that every portion may be fully exposed to the solvent action of the fluid. In some few cases (as with gentian, etc.) the "slicing," or reduction to fragments, is often conveniently deferred until the action of the menstruum shall have so far softened the ingredients as to render them of easy division by the knife. Those substances (as sarsaparilla, chamomiles, etc.) whose medicinal principles reside in the cortical portion, of which are of easy solubility, are commonly subjected to the action of the menstruum without being subjected to any particular preparation. — In the preparation of *aqueous E.* the ingredients are treated with water until all the soluble matter that it is desirable to obtain is dissolved out. There are several methods of effecting this object, depending upon the nature of the substances acted on. In some cases maceration in cold water is resorted to; in others, percolation with that fluid in a "displacement apparatus." More generally, however, boiling water is poured on the substance, and is digested on it for some time, as in the preparation of infusions; or the substance is exhausted by boiling in water, as in the preparation of decoctions. After the ebullition or infusion has continued a sufficient time, the heat is removed, and the liquid portion drawn off. The ingredients are then pressed to extract the remaining liquid; or they are washed or "sparged" with hot water, which expels it by displacement. According to the usual practice in the majority of cases, a second quantity of water is poured on after the first has been thoroughly drained off, and the effusion or decoction is repeated a second and even a third time, or until the ingredients are perfectly exhausted of their soluble portion. The liquor or liquors thus obtained being allowed to repose for 15 or 20 minutes, for the purpose of depositing the sand or other gritty and heavy matter that is mechanically mixed with them, are carefully decanted from the sediment, and, after being run through a fine hair sieve, or flannel bag, are ready for concentration. In some instances, however, this method proves insufficient to render the liquid clear. In such cases the solution may generally be rendered transparent by clarification with a little white of egg, removing the scum as it rises, straining the liquid through flannel, as before: or the liquid may be filtered through a bag made of fine "Welsh flannel," or of "twilled cotton cloth" (Canton flannel), both of which should be soaked in clean water for at least an hour before use. In the small way, filters of linen or paper are sometimes employed; but as all media sufficiently fine to render vegetable solutions transparent soon choke up, this filtration is objectionable, from the length of time it occupies. In some houses the aqueous infusion or decoction is allowed to repose for 24 hours, and then is decanted and evaporated; but such plan is objectionable, as, however smooth and glossy *E.* so prepared may appear, their medicinal virtues are lessened by the lengthened exposure to the atmosphere. When about one half of an aqueous solution has evaporated, it is often advantageous to repass it through a flannel or horsehair strainer, to remove the flocculi that generally form by the action of the heat and air. This is especially necessary with vegetable solutions prepared without boiling, and should be adopted whenever a smooth and clear *E.* is desired. On the large scale, the evaporation of infusions or decoctions for *E.* is usually conducted in very wide, shallow, copper or tinned-copper pans, having steam-tight jackets of cast-iron, and heated by steam "playing" between the two. The rapid deterioration which vegetable juices and solutions undergo by exposure to the air, especially at high temperatures, has led to the introduction of apparatus by which they may be concentrated without contact with the atmosphere, and at a less degree of heat than is required for that purpose in open vessels. Such is the method, commonly called "Barry's process," in which the air is removed from certain air-tight refrigerators by the introduction of steam, which is then condensed by the application of cold, by which means a partial vacuum is obtained. Another process for attenuating the atmosphere over the surface of fluids during evaporation is by the action of an air-pump. This plan was introduced by Howard, and is commonly applied to the concentration of sirups in the sugar refineries. *E.* obtained by either of these methods are said to be prepared "in vacuo," and are found in practice to be immensely superior to the common *E.* of commerce. — *Alcoholic* and *spirituous E.* are prepared by evaporating a filtered concentrated tincture of the ingredients in any suitable vessel, by which the volatilized spirit may be saved. In general, rectified spirit is used as the menstruum; but in some cases proof spirit is employed; and in others, the substances are first digested in proof spirit, and afterwards in water, and the mixed tincture and infusion evaporated in the usual manner. — *Ethereal E.* are obtained in a similar manner to alcoholic ones; but being merely prepared in small quantities at a time, the process may be conveniently performed in glass vessels. When it is required to boil either of the above fluids (alcoholic or ethereal), or any other volatile liquid on the ingredients, a vessel fitted with a long tube, or a Liebig's condenser reversed, may be used to prevent any loss of the menstruum.

The quality of an extract cannot be ascertained by mere inspection, nor is it readily discovered by chemical tests. A knowledge of these facts has induced the mercenary and fraudulent manufacturer to employ damaged and inferior drugs in their preparation, alike regardless of the welfare of the patient and the credit of the practitioner. A common practice with some manufacturers is not only to pick out the least expensive variety of every drug for the preparation of their extracts, but the most inferior and often damaged and worthless portion of this already inferior article. The production of a smooth, bright, and glossy extract is all that is usually attempted by these individuals, and all that is sought after by the mass of purchasers, who mistake the simulation of the mere external signs of good quality for its actual existence. It is a fact, which we can verify from extensive experience in the laboratory, and from years of practical observation on this point, that extracts faithfully prepared from good materials do not possess the sightly and pleasing appearance of those commonly vended by the wholesale druggists. On comparing the extracts prepared by different metropolitan houses, we have found that those which have exhibited a remarkably bright and glossy appearance have been uniformly inferior, and sometimes nearly inert; whilst others, with a less prepossessing appearance, have been generally of good quality. These facts are well established by reference to the extracts of those houses and institutions that are remarkable for the superior quality of their preparations, and by comparing them with the common extracts of the shops supplied by the wholesale trade. — A good extract should be: 1. Free from grit, and wholly soluble in 20 parts of the menstruum employed in its preparation, forming a nearly clear solution. — 2. It should have a uniform texture and color, and be of a proper consistence. — 3. If a narcotic or active extract, it may be exhibited in proper doses, and its effects watched. Its activity may also be tested on any small animal. — 4. An assay for the proximate vegetable principle (alkaloid, etc.) contained in the plant from which it has been prepared may be made. The extracts prepared from the expressed juices of plants, without straining off the coagulated albumen, are, of course, exceptions to the first test. Unfortunately, these tests are not always easily performed, and the last two are inapplicable to those extracts that exercise no very marked physiological action, unless when taken in repeated doses, long continued. This want of a ready means of accurately testing the qualities of extracts has enabled the fraudulent manufacturer to sell inferior articles with impunity, and often without the least fear or danger of detection.

Extrait [Fr.], literally, an extract. Among perfumers, extraits are mostly spirituous solutions of the essential oils or odorous principles of plants and other fragrant substance. The French commonly apply the term to any concentrated spirit, either simple or compound. In French perfumery upwards of 60 preparations of the kind are distinguished by this name. The extracts of *jasmine, jonquil, May-lily, orange-blossoms, violets*, and other like flowers of delicate perfume are obtained by agitating and digesting the "huiles" and "pomades" of the flowers with the purest rectified spirit in the manner described under SCENTED SPIRITS ("esprits"). This process is repeated with fresh oil or pomade until the spirit is rendered sufficiently fragrant. The other extracts (both simple and compound) are made by the common methods of infusion and distillation. See ESSENCE, EXTRACT, SPIRIT, etc.

Extra State, a grade of flour made of spring wheat bolted clear.

Extravagance, recklessness and improvidence; a waste of materials.

Eye (Artificial), a shell or segment of a hollow sphere, usually made of enamel, and so inserted as to present the appearance of the natural eye.

Eye-Blinds, bandages for a horse's eyes when being singed, bled, etc.

Eye-Bolt, a small ring-bolt used on shipboard, to which ropes are fastened.

Eyebright, a meadow plant, the *Euphrasia officinalis*, used medicinally.

Eye-Flap, a blinder on a horse's headstall.

Eye-Glass, a single spectacle-glass worn by near-sighted persons; the outer glass of a telescope, which is placed against the eye.

Eyelet, a short metallic tube whose ends are flanged over against the surfaces of the object in which the said tube is inserted. It is used as a bushing or reinforce for holes, to prevent the tearing of the perforated edge of the fabric or material by the lacing. Eyelets are made from strips of metal by a cutting and punching operation, or punching and shaping. — *E. H. Knight.*

Eye-Piece, the lens or combination of lenses used in microscopes or telescopes to examine the aerial image formed at the focus of the object-glass.

F

Fabric, the texture or structure of a manufactured article. — Cloth of any description or of any material made by weaving or felting. — The frame or structure of anything.

Fabricant [Fr.], a manufacturer.

Face, the edge, surface, or front of anything. — The dial of a watch.

Face-Guard, a wire-gauze mask, with windows for the eyes, used by workmen, as in stone-breaking, in chemical or manufacturing purposes, etc.

Facets, the various sides into which a precious stone, etc., is cut, and which contribute much to its reflective brilliancy.

Face-Wheel, Crown-Wheel, Contrate-Wheel, is a wheel in which the cogs are perpendicular to the plane of motion.

Fac-simile, a true likeness or representation of anything; an exact copy of a handwriting.

Factitious, made by art, in distinction from what is produced by nature; artificial.

Factor, a commercial agent residing at a distance from his principal, and having the superintendence of some branch of his employer's trade in the place where he acts. A factor differs from an ordinary agent in this, that he does not represent his principal, but acts as a principal himself in his transactions with third parties. He is distinguished from a broker, in as far as he has the personal possession and management of the goods over which his superintendence extends. The factor carries on his commercial operations on commission. He receives consignments from his principal, and makes sales and remittances in return, balancing accounts from time to time. He may act without disclosing the name of his principal. He frequently holds a *del credere* commission (see Del Credere). Like other mandatories, the factor is personally responsible for whatever he may do exceeding the powers delegated to him, and, where they are not expressed in the terms of his commission, his powers will be limited by the custom of the trade. He is not responsible "at all events" (as it is termed) for the safety of goods within his charge, that is to say, he is not liable for them as if he had insured them against all risks; but he ought to bestow on them the same care as on his own property, and it would appear that he will be amenable to his employer if he do not. He is not in the general case responsible for the consequences of fire, robbery, or other accident; but there are precautions which, in certain circumstances, he must adopt. One of the most important is that of protecting his principal's interest by insurance, and, if he have effects in hand, he is in all cases bound to comply with directions to insure, being, on failure, himself considered responsible. Where goods are consigned to a factor, his title to them, and right to dispose of them, is generally conveyed in an indorsed bill of lading; but in questions with parties privy to the transaction, it is held that a letter of advice is sufficient. Where the factor has absolute power to sell, indorsement of a bill of lading while the goods are at sea will pass them absolutely, and bar the principal's right to stop *in transitu*; and in the absence of fraud it seems that the assignee's knowledge of the factor's character would not affect his title; for, in order to make notice material, it must be notice of something inconsistent with the right of the assigner to do the act under which the assignee claims, or of such circumstances as render the bill of lading not fairly and honestly assignable. But, inasmuch as the character of a factor is consistent with the power to sell, the knowledge of this circumstance would not probably be considered as any impeachment of the transaction if it would be otherwise valid. A factor has a lien on the goods consigned to him, not only for charges affecting those goods, but for his general balance. The lien extends to every portion of the goods, and, when they are disposed of, to the proceeds. On parting with possession, the factor abandons the lien; and goods transmitted to him with a specific appropriation are excepted from it.

Factorage, the commission paid to a factor by his employer for business done.

Factory, a word more commonly used in England than in this country as an abbreviation for manufactory, etc.; usually applied to buildings of an extensive scale, where complicated machinery, worked by motive-power, is used. In the U. States, any building in which textile products are manufactured by machinery worked by steam, water, or some other power, is called a mill.

Factory-Maund, a commercial weight of India, of 74 lbs. 10 oz. 10⅔ drachms, avoirdupois, and less ponderous than the ordinary bazaar maund.

Factotum, a useful person; one who can turn his hand readily to anything.

Facture [Fr.], **Fattura** [It.], **Factura** [Port. and Sp.], an invoice or bill of parcels; a written account of the particulars of merchandise shipped or sent to a purchaser.

Faculty, a privilege or dispensation. — A body of masters or professors of law, medicine, sciences, etc.

Fade, to wear away; to wither or lose color or distinctness, as in silks, colored stuffs, etc.

Fadge, a name amongst leather-sellers for a covering of undressed leather.

Fading, loss of strength or color; decay.

Fag, one who works hard. — A knot in cloth.

Fag-End, the refuse part or worst end of a web of cloth or any fabric. — The untwisted end of a rope.

Fagot, a quantity of steel in bars, equal to 120 lbs.; a bundle of sticks of wood about 3 feet long and 2 feet round.

Fagotto, a brass wind-instrument resembling a bassoon.

Faham-Tea, a name given in the Mauritius to the dried leaves of the *Epimedium macranthum* (Fig. 169), a fragrant herbaceous plant, which owes its odor to the presence of coumarin. The infusion is drunk to promote digestion, and is useful for certain diseases of the lungs.

Fahrenheit, a thermometer scale in which the freezing-point of water is fixed at 32 degrees, and the boiling-point at 212. See Thermometer.

Faience, or **Fayence**. See Pottery.

Fail, to suspend payment; to become insolvent or bankrupt.

Failure. See Insolvency.

Faints, or **Feints**, the impure spirit in the process of distillation passing over at first and at last from the still; the former being called strong and the latter weak faints.

Fair. A *F.* is defined as a "greater species of market recurring at more distant intervals"; both have been distinguished by Lord Coke from

"mart," which he considers as a greater species of *F.*; all three may comprehensively be described as customary or legalized public places for the sale of commodities (including labor). Thus, in England, no *F.* can be held without a grant from the sovereign, or prescription which presupposes such grant. In France the establishment and abolition of *F.* — with the exception of the cattle-markets and the markets of the metropolis — are generally left to the discretion of the departmental prefects The most commonly accepted derivation of the word *F.* is from *feriæ*, a name which the church borrowed from Roman custom and applied to her own festivals. A *F.* was generally held during the period of a saint's feast, and in the precincts of his church or abbey, — the time and the place of the chief popular assemblage. Most of the famous *F.* of mediæval

Fig. 169 — Faham-Tea Plant.

Europe, with their tolls or other revenues, and, within certain limits of time and place, their monopoly of trade, were grants from the sovereign to abbots, bishops, and other ecclesiastical dignitaries. Their "holy day" associations are preserved in the German word for *F.*, *Messen*. There are grounds, however, for the supposition that *F.* were already existing national institutions long before the church turned, or was privileged to turn, them to her own profit. The Romans appear to have elaborated a market law similar to that in force throughout mediæval Europe It has also been supposed that the ancient *F.* of Lyons were a special privilege granted by the Roman conquerors; and Sidonius Apollinaris, A. D. 427, alludes to the *F.* of the district afterwards known as the county of Champagne, as if they were then familiarly known institutions. *F.*, in a word, would not only have arisen naturally, wherever the means of communication between individual centres of production and consumption were felt to be inadequate to the demand for an interchange of commodities; but, from their very nature, they might be expected to show some essential resemblances, even in points of legislation, and where no international transmission of custom could have been possible. Thus, the *F.* courts of pre-Spanish Mexico corresponded very closely to those under whose supervision the Beaucaire *F.* is conducted in the present day, and the Spaniards, when first they saw the Mexican *F.*, were reminded of the like institutions in Salamanca and Granada. But, notwithstanding the great antiquity of *F.*, their charters are comparatively modern, — the oldest known being that of St. Denys, Paris, which Dagobert, king of the Franks, granted (642 A. D.) to the monks of the place "for the glory of God, and the honor of St. Denys at his festival." The first recorded grant in England appears to be that of William the Conqueror to the Bishop of Winchester, for leave to hold an annual "free *F.*" at St. Giles's Hill. The monk, who had been the king's jester, received his charter of Bartholomew *F.*, Smithfield, in the year 1133. And in 1248 Henry III. granted a like privilege to the Abbot of Westminster, in honor of the "translation" of Edward the Confessor. Sometimes *F.* were granted to towns as a means for enabling them to recover from the effects of war and other disasters. Thus, Edward III. granted a "free *F.*" to the town of Burnley in Rutland, just as, in subsequent times, Charles VII. favored Bordeaux, after the English wars, and Louis XIV. gave *F.* charters to the towns of Dieppe and Toulon. The importance attached to these old *F.* may be understood from the inducements which, in the 14th century, Charles IV. held out to traders visiting the great *F.* of Frankfort-on-the-Main. The charter declared that both during the continuance of the *F.* and for eighteen days before and after it, merchants would be exempt from imperial taxation, from arrest for debt or civil process of any sort, except such as might arise from the transactions of the market itself and within its precincts. Philip of Valois's regulations for the *F.* of Troyes in Champagne might not only be accepted as a fair type of all subsequent *F.* legislation of the kingdom, but even of the English and German laws on the subject. The *F.* had its staff of notaries for the attestation of bargains, its court of justice, its police officers, its sergeants for the execution of the market judges' decrees, and its visitors, — of whom we may mention the *prud' hommes*, — whose duty it was to examine the quality of goods exposed for sale, and to confiscate those found unfit for consumption. The confiscation required the consent of five or six representatives of the merchant community at the *F.* The effect of these great "free *F.*" of Europe on the development of society was indeed great. They helped to familiarize the western and northern countries with the banking and financial systems of the Lombards and Florentines, who resorted to them under the protection of the sovereign's "firm peace" and the ghostly terrors of the Pope. They usually became the seat of foreign agencies. Like the church on the religious side, the free *F.* on the commercial side evoked and cherished the international spirit. And during long ages, when commercial "protection" was regarded as indispensable to a nation's wealth, and the merchant was compelled to "fight his way through a wilderness of taxes," they were the sole and, so far as they went, the complete substitute for our modern free trade. Their privi-

leges however, were, from their very nature, destined to grow more oppressive and intolerable the more the towns were multiplied and the means of communication increased. The people of London were compelled to close their shops during the days when the Abbot of Westminster's *F.* was open. But a more curious and complete instance of such an ecclesiastical monopoly was that of the St. Giles's *F.*, at first granted for the customary three days, which were increased by Henry III. to sixteen. The Bishop of Winchester was, as we have seen, the lord of this *F.* On the eve of St. Giles's feast the magistrates of Winchester surrendered the keys of the city-gates to the bishop, who then appointed his own mayor, bailiff, and coroner, to hold office until the close of the *F.* During the same period Winchester and Southampton also — though it was then a thriving trading town — were forbidden to transact their ordinary commercial business, except within the bishop's *F.*, or with his special permission. The bishop's officers were posted along the highways, with power to forfeit to his lordship all goods bought and sold within seven miles of the *F.*, — in whose centre stood "the pavilion," or bishop's court. It is clear, from the curious record of the "Establishment and Expenses of the Household of Percy," fifth earl of Northumberland, that *F.* were the chief centres of country traffic even as late as the 16th century. They began to decline rapidly after 1759, when good roads had been constructed and canal communication established between Liverpool and the towns of Yorkshire, Cheshire, and Lancashire. In the great towns their extinction was hastened in consequence of their evil effects on public morals. All the London *F.* were abolished as public nuisances before 1855, — the last year of the ever-famous *F.* of St. Bartholomew; and the F. of Paris were swept away in the storm of the Revolution.

English Fairs and Markets. — For the general reasons apparent from the preceding sketch, *F.* in England, as in France and Germany, have very largely given way to markets for specialties. Even the live-stock market of the metropolis is being superseded by the dead-meat market, a change which has been encouraged by recent legislation on cattle disease, the movements of home stock, and the importation of foreign animals. Agricultural markets are also disappearing before the "agencies" and the corn exchanges in the principal towns. Still there are some considerable *F.* yet remaining. Of the English *F.* for live-stock, those of Weyhill in Hampshire (Oct. 10), St. Faith's, near Norwich (Oct. 17), as also several held at Devizes, Wiltshire, are among the largest in the kingdom. The first named stands next to none for its display of sheep; while the second is the principal resort of the Scotch drovers and cattle-dealers, and supplies a large proportion of the fat stock required for the London market. Horncastle, Lincolnshire, is the largest horse *F.* in the kingdom, and is regularly visited by American and Continental dealers. The other leading horse *F.* in England are Howden in Yorkshire (well known for its hunters), and Woolbridge (on Lady Day) for Suffolk horses. Exeter December *F.* has a large display of cattle, horses, and most kinds of commodities. Large numbers of Scotch cattle are also brought to the *F.* of Market Harborough, Carlisle, and Ormskirk. Ipswich has a *F.* for lambs on the 1st of August, and for butter and cheese on the 1st of September. Gloucester *F.* is also famous for the last-named commodity. The guild or jubilee held at Preston, Lancashire, every twentieth year, occurred last in 1862. Falkirk *F.*, or tryst, for cattle and sheep, is one of the largest in Scotland; and Ballinasloe, Galway, holds a like position among Irish *F.* The Ballinasloe cattle are usually fed for a year in Leinster before they are considered fit for the Dublin or Liverpool markets. In 1790 there were 61,931 sheep and 8,632 horned cattle exhibited at the *F.*, and for 1867 the returns, in the foregoing order, were 73,364 and 23,734.

French Fairs. — The most important is that of Beaucaire, once among the first in Europe. Its position on the Rhone (14 miles east of Nismes), and its connection with the canals, still enable it to maintain a high rank among the Continental markets. It lasts from the 22d to the 28th July, and is visited by about 60,000 persons, from all parts of the Continent between Spain and the Levant; articles of all descriptions are sold at it. It is a rule that all bills due at this *F.* must be presented on the 27th and protested, if necessary, on the 28th.

German Fairs.— First, though no longer of world-wide importance, are those of Frankfort-on-the-Main, Frankfort-on-the-Oder, and Leipsic. Those of Frankfort-on-the-Main begin on Easter Tuesday and on the nearest Monday to Sept. 8, respectively, and their legal duration is three weeks, though the limit is regularly extended. The *F.* of the second-named city are *Reminiscere*, February or March; *St. Margaret*, July; *St. Martin*, November. Ordinarily they last fifteen days, which is double the legal term. The greatest of the German *F.* are those of Leipsic, whose display of books is famous all over the world. Its three *F.* are dated Jan. 1, Easter, Michaelmas. The Easter one is the book *F.* which is attended by all the principal booksellers of Germany, and by many more from the adjoining countries. Most German publishers have agents at Leipsic. As many as 5,000 new publications have been entered in a single Leipsic catalogue. As in the other instances given, the Leipsic *F.* last for three weeks, or nearly thrice their allotted duration. Here no days of grace are allowed, and the holder of a bill must demand payment when due, and protest, if necessary, on the same day, otherwise he cannot proceed against either drawer or endorser.

Russian Fairs. — These are very numerous, the chief being those of Nijni Novgorod, of Irbit in Perm, Kharkoff (January and August), Poltava (August and February), Koreunais in Koursk, Ourloupinsknia in the Don Cossack country, Krolevetz in Tchernigoff, and a third *F.*, held at Poltava on the feast of the Ascension. It is calculated that in 1851 the aggregate value of goods sold at the above-named *F.* amounted to nearly 120,000,000 silver roubles. The chief *F.* of Novgorod is attended by 100,000 to 130,000 persons from all parts of Asia and of Eastern Europe. Thirty years ago the *F.* of Kiatcha, on the Russo-Chinese frontier, yielded one million sterling in revenue; but in 1867 the sum had fallen by one half. This was in consequence of the opening of new communications, and the abolition of the Kiatcha monopoly.

Turkish Fairs. — Of these there are a very considerable number, and the vast bulk of the internal commerce of the country is transacted at them. Among the most noteworthy are the *F.* of Usundji, in Roumelia, on a tributary of the Moritza, 40 miles from Adrianople; Janina in Albania; Strouga, on the lake of Orida; Novi-Bazaar in Upper Mœsia; Islioni in Thrace; Nicopoli and Prelip in Macedonia; Eski-djouma in Bulgaria;

and Zeitoun and Pharsalia in Thessaly. There is a large show of western manufactures at the Usundji *F.*

Indian Fairs. — The largest of these, and perhaps the largest in Asia, is that of Hurdwar, on the upper course of the Ganges. The visitors to this holy *F.* number from 200,000 to 300,000; but every twelfth year there occurs a special pilgrimage to the sacred river, when the numbers may amount to a million or upwards. Those who go solely for purposes of trade are Nepaulese, Mongolians, Thibetans, Central Asiatics, and Mahometan pedlers from the Punjab, Scinde, and the border states. Persian shawls and carpets, Indian silks, Cashmere shawls, cottons (Indian and English), preserved fruits, spices, drugs, etc., together with immense numbers of cattle, horses, sheep, and camels, are brought to this famous *F.*

American Fairs. — In the U. States the word "fair" is principally confined to assemblages for the sale and purchase, under the control of private companies, and for charitable purposes, of fancy articles, which are generally contributed gratuitously. The word "fair" is also applied to state and county agricultural and industrial exhibitions, intended for competition rather than general traffic. Among the best known of these was the "New York World's Fair," opened in 1853. The American Institute of New York, the Franklin Institute of Philadelphia, the Mechanics' Institute of Boston, and other institutions of similar character, hold annual *F.* for the encouragement of the agricultural and manufacturing arts.

Fairfield. See CONNECTICUT.

Fairfield, a fire insurance Co., located in South Norwalk, Conn., organized in 1869. *Statement:* Jan. 1, 1879, cap. stock paid up in cash, $200,000; net surplus, $33,460.51; total cap. and surplus, $233,460.51; risks in force, $14,290,538; premiums, $125,836.13; premiums received since the organization of the Co., $1,130,778.07; losses paid, $661,354.05; cash dividends paid to stockholders, $146,000.

Fairing, a gift or present purchased at a fair.

Fairly, justly; equitably; plainly; candidly.

Fairway, the mid passage in a short channel; the navigable part of a river.

Falcated, bending like a hook.

Falding, a kind of coarse cloth.

Falernian Wine. See ITALIAN WINES.

Falkland Islands [Fr. *Malouines:* Sp. *Malvinas*], a group of islands belonging to Great Britain. They are the only considerable cluster in the South Atlantic Ocean, and lie about 300 m. E. of the Straits of Magellan, between lat. 51° 15′ and 52° 30′ S., lon. 57° 40′ and 61° 20′ W. They consist of East *F.* (area 2,700 sq. m.), West *F.* (2,000 sq. m.), and upwards of 100 small islands (islets, rocks, and sandbanks), comprising in the aggregate 4,740 sq. m., and a population, in 1878, of 1,339, of whom but 384 were females. These islands are of some importance as a commercial and military station.

Fall, a decrease in price or value. — Autumn; the season of the fall of the leaf. — A border of lace to the neck part or body of a lady's evening-dress. — A short veil for a lady's bonnet or hat. — The amount of descent in a given distance; the vertical pitch of water at a mill; the inclination of a water-course. — The loose end of a tackle; that part to which the power is applied in hoisting.

Fall-Board, the wooden drop shutter of a window, which moves up and down on hinges.

Fall Goods, goods adapted for the demands of the fall or autumnal season.

Falling Market, a continuous decline in the price of goods.

Fallow, untilled land; ground lying at rest, not under a grain crop.

Fall River, a city and port of entry of the State of Massachusetts, 48 m. S. of Boston, situated on the Fall River, at its junction with the Taunton, which falls into Mount Hope Bay, a branch of Narragansett Bay. The harbor on Taunton River is safe and easy of access, and has depth of water sufficient for the largest ships. Fall River has a large coasting-trade, and is engaged in the whale and other fisheries. It has extensive cotton and woollen factories, bleaching-works, foundries, etc., and communicates regularly with New York by steamers, and with Boston by railway. Pop. 50,000.

Falmouth. See GREAT BRITAIN.

False-Core, a name among brass-founders for a loose piece of the mould not intended for holes; by the iron-founder it is called a drawback.

False-Keel, pieces of timber secured under the main keel of vessels.

False-Key, a pick-lock.

False Pretences, false representations and statements made with a fraudulent design to obtain "money, goods, wares, or merchandise," with intent to cheat. But misrepresentations may be made for the purpose of gaining credit, without intention to cheat. Instances have occurred where goods so obtained, after having been profitably disposed of by the party obtaining them, were paid for according to the terms. It seems, however, that in the construction of law the crime is the same. The intent to cheat is inferred from the misrepresentation, and the intent is all that is requisite. It is not necessary that the party defrauded should sustain loss. Property acquired by means of false pretences may be recovered by the party from whom it was thus obtained; and obtaining goods by false pretences is an indictable offence. — *T. McElrath.*

Famine, dearth or destitution; a scarcity of food or provisions for sustenance.

Famis, a kind of Spanish gold cloth or brocade.

Fan, a well-known hand ornament or instrument chiefly used by ladies to cool themselves by agitating the air. Upward of 3,000 years ago the artists of ancient Egypt painted the fan on the walls of the tombs at Thebes, where the Pharaoh sits surrounded by his fan-bearers. The fan is mentioned by Euripides, and its Grecian forms were far more beautiful than the Egyptian. The wings of a bird joined laterally and attached to a slender handle formed the simple yet graceful fan of the priest of Isis, when Isis became a Grecian deity. It was sometimes formed of feathers of different lengths, spread out in the form of a semicircle, but pointed at the top. This fan, the precise type of the state-fan of India and China of the present day, was waved by a female slave. When the Romans were at meals, it was the duty of certain slaves, when the weather was warm, to cool the room with fans and drive away the flies. The modern Greek church places a fan in the hands of its deacons to guard the officiating priest and the elements from desecration. When the fan was brought to France by Catherine de Medicis, it was so constructed that it could be folded in the manner of those used in the present day. Fans, in the luxurious reigns of Louis XIV. and XV., shone with gilding and gems, and were ornamented with the pictures of Boucher and Watteau.

China and France are the two great fan-manufacturing countries. In the lacquered fans the superiority of the natives of China is fully admit-

ted. These are unrivalled both in lowness of price and in originality of design, brilliancy of coloring, and in general correctness of workmanship. In China the manufacture of fans is almost entirely confined to Canton, Soutchou, Hang-tchoo, and Nankin. The fans of ivory and bone, and of feathers, are made exclusively for exportation to Europe or America. Those used by the Chinese and the Japanese are of bamboo, polished or japanned, and covered with paper. They are largely imported in the U. States, principally from Japan.

Manuf. Fan-making calls for a considerable amount of delicacy in the working up of the materials which form them. Ivory, mother-of-pearl, tortoise-shell, bone, wood, gold, silver, silk, satin, parchment, paper, whalebone, lambskin, gauze, feathers, — all are employed, according to the price paid for the fan, which may be as high as $500, or as low as a half-cent. In France this manuf. has arrived at a high degree of perfection, and presents a remarkabl. instance of the subdivision of labor. About twenty different operations, performed by as many pairs of hands, are necessary to the production of a fan which sells for less than one cent. The processes are not all carried on in the same manufactory, but form four distinct branches of trade, directed by distinct masters; but the operatives usually work at home at their own houses. The framework of fans is mostly made in the department of Oise, where 2,000 men, women, and children are thus employed. The woods employed are chiefly plum, ebony, lime, and sandal-wood; and the piercings, which form such a general decoration to fans, are performed by minute saws, which the workman makes for himself out of pieces of watch-spring. In one fan there are in some specimens 1,600 saw-piercings in a square inch of mother-of-pearl. The printing, the coloring, the mounting, and the finishing of fans are mostly conducted at Paris, where the fan-factories are on a considerable scale. Fans are also extensively made in England, Germany, and the U. States; but the greatest number of fans used by the world of fashion come from Paris.

Imp. duty: common palm-leaf fans, free; all others, including those made of the leaf of the palm-tree, with artificial handles, 35 per cent.

Ventilating Fan. When a drum or wheel is rotated, the centrifugal force tends to drive out water or air from near the axis towards the circumference This has suggested a *ventilating fan* for drawing out impure air from mines and large buildings. Desaguliers invented such a fan many years ago. It was a hollow wheel, 7 feet diameter by 1 foot broad or deep; it was divided into compartments by twelve radial partitions, all opening outwardly into a circular space near the fireplace, and inwardly into a central opening. This wheel revolved nearly in contact with an outer cell. By so doing, air was sucked by the central opening into the twelve channels, along these to the circular space, and thence into an exit-pipe. The partial vacuum thus formed at the centre of the wheel incited a rush of air from the shaft of a mine with which it was placed in combination; and in this way foul air was drawn out of the mine. This wheel was rotated by hand; but the descent of a weight might be made to produce the effect; and so, of course, might water-power and steam-power. All the ventilating fans since invented have acted on a similar centrifugal principle, however modified in detail. Fairbairn and Lillie's fan, much used in the large factories of the North, will produce such a powerful draught as to draw all the vitiated air out of a gallery 200 or 300 feet long; and by connecting pipes, all the rooms in all the successive stories can be similarly ventilated. Or it may be used for drawing all dust and fibres out of the workshops in which cotton and other materials are treated. Or it may draw air out of lofty shafts, or even blow air into forge fires. In one form of construction, the wheel is concentric with the case in which it works; but a greater working efficiency is obtained by making the two eccentric, the wheel being nearer to one side of the case than to the opposite. In Chaplin's *duplex pressure fan* there are two wheels instead of one, but both revolving on one axis; the air is drawn from the one to the other, and thence discharged with greater force than when only one wheel is used The partitions, vanes, radii, or spokes vary greatly in number and form, according to the mode in which the inventor intends them to act. Other improvements, introduced by many inventors, have so improved the ventilating fan, that it is now rapidly superseding the other blowing-machines, giving a uniform blast of air instead of a series of puffs. The fan represented in Fig. 170 is used as a a blowing-machine in manufactories to send air into the furnaces. It must receive an extremely rapid motion, and then discharges air with great

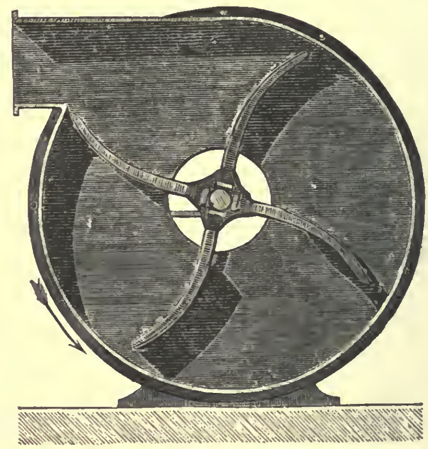


Fig. 170. — Ventilating Fan.

regularity into the tub with which it communicates. Its arms are slightly curved in a way contrary to that in which it moves, so that they more easily abandon the air with which they are in contact when they pass before the pipe seen at top of the figure, which conveys air to the furnace.

Fanal [Fr.], a ship's lantern, or watch-light; a lighthouse.

Fancy-box Maker, a manufacturer of cardboard and other boxes, for linen goods, or confectioners' use, etc.

Fancy-check Muslins, cambrics marked with cords and stripes, by heavy threads introduced into the warp and weft.

Fancy-Goods, fabrics made of various patterns, as ribbons, silks, satins, etc., differing from those which are of a plain or simple color; light and ornamental goods; small wares.

Fancy Woods, a name under which most of the furniture woods are sold, such as mahogany, rosewood, satin, kingwood, etc.

Fanega, a Spanish measure used for different purposes. As a dry measure in Spain, it varies from 1½ to 2½ bushels. In South America, the fanega of Chile, for grain, ranges from 153 lbs. weight to upwards of 200 lbs.; in Central America, the fanega of maize weighs 400 lbs.; in Monte Video, it is as much as 3¾ bushels; but the average computation may be taken at 5 fanegas to the English quarter of 8 bushels. As a land measure the fanega is 40,000 varas of about 2¾ feet each.

Fanegada, a Spanish land measure; as much ground as may be sown with a fanega of grain; about 153 square yards, = 170 varas.

Faneuil Hall Fire Insurance Co., located in Boston, Mass., organized in 1871. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $300,000; net surplus, $28,258.85; risks in force, $22,440,-811; premiums, $310,697.53; premiums received since the organization of the Co., $1,319,360.48; losses paid, $711,747.06; cash dividends paid to stockholders, $50,250.

Fang, a projecting tooth or prong in a lock, bolt, or tumbler. — A long nail. — The tang of a

tool. — On shipboard, the valve of a pump-box; also the bend of a rope.

Fangot, a quantity of wares, as raw silk, etc., from 1 to 2¾ cwts.

Fank, the name, in some parts of Scotland, for a sheep-cot or pen; to coil a rope.

Fanlight, a framed window shaped like an outspread fan, usually placed over doors.

Fanner, and **Fanning-Mill**. See WINNOWING-MACHINE.

Fantail, a kind of joint. — A gas-burner, in which the burning jet has an arched form.

Fard, a cosmetic or paint for the face. See ROUGE.

Fardage [Fr.], the tonnage of a ship.

Fardel, a bundle or little pack; a term used in reckoning in Germany, equal to 45 barchets or pieces of cloth of 22 or 24 ells each; the fourth part of a yard of land.

Fare, a word of wide application; food or provisions for the table; the price of passage for travelling; the sum paid or due for conveying a person by land or water.

Farina, the flour or meal of any species of corn, pulse, tuber, or starchy root. The most important kinds of farina are noticed under their respective heads.

Farinaceous, containing meal.

Farm, to take or hire at a certain rate per cent; a monopoly, license, or permission to vend certain articles subject to duty; a portion of land with suitable buildings, etc., devoted to agricultural operations.

Farmer, a tenant; a lessee; a person employed in the cultivation of land, breeding and rearing live-stock, and the management of the commercial products they yield.

Farmers' Fire Insurance Co., located in York, Pa., organized 1853. *Statement*, Jan. 1, 1879: Net surplus, $148,208.82; risks in force, $39,149,523; premiums, $480,454.27; premiums received since the organization of the Co., $3,134,554.49; losses paid, $1,931,286.79.

Farm-yard Manure, the excrements of cattle, and other fertilizing substances collected from stables, cattle-sheds, etc., for spreading on land, and largely used.

Faroe Islands. See DENMARK.

Farragut Fire Insurance Co., located in New York City, organized in 1872. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $161,067.78; risks in force, $24,955,185; premiums, $123,714.64; premiums received since the organization of the Co., $947,842.92; losses paid, $285,463.10; cash dividends paid to stockholders, $162,000.

Farrier, one who shoes horses; one who professes to cure the diseases of horses and cattle; a veterinary surgeon.

Farthing, a small English copper coin, the fourth part of a penny, or about one half a cent.

Fascet, a rod thrust into the mouth of a bottle, in the operation of glass-blowing, to convey the article to the annealing furnace.

Fashion [Fr. *mode*], a term used to signify the prevailing mode or taste in any country, the only recognized quality which it possesses being mutability. It may safely be averred that, in proportion to the influence which fashion exercises in any country may its claim to civilization be vindicated, — nothing being so characteristic of a rude and barbarous state of existence as a rigid adherence to the customs of antiquity. The term *fashion* has generally been considered as applicable chiefly to the adornment of the person, in conformity with the prevailing taste as introduced by some individual of consideration in society; but it has a much wider signification, being applied to the most trivial kind of conventional usages, a disregard or ignorance of which is sufficient, in the eyes of the votaries of this tyrannical goddess, to banish the offender beyond the pale of civilized society.

Fashioner, one who fashions or shapes things; a tailor.

Fashioning-Needle, one of the pins or fingers employed in the knitting-machine to take loops from certain of the bearded needles and transfer them to others for widening or narrowing the work.

Fass, a measure of capacity used in Germany, of a very variable character, ranging as a dry measure from 1½ gallons in Dusseldorf, to 11½ in Altona. For charcoal it is 59 gallons at Treves, in Prussia. As a liquid measure it is equally variable and difficult to define, and differs with the nature of the contents. In Vienna the fass of wine is about 127½ gallons, in Leipsic it is 83½, and so on. One Hamburg last of 60 fass is equivalent to 11 imperial quarters; 1 fass = 2 himpten.

Fast, the rope by which a vessel is secured to a wharf; in nautical language, attached to; as when a boat is secured by a rope. A vessel aground is said to be "hard and fast."

Fast Colors are colors that produce a fixed and permanent dyeing; that is to say, which do not fade by exposure to the air or by washing.

Fastening, a stop or holdfast; a bolt or bar; a screw or spring-catch for window-sashes; also, a security for doors.

Fathom, an English nautical measure of 6 feet, chiefly used for measuring the length of cordage, and the depth of water and mines.

Fat [Lat. *adeps*], the fat of animals is a concrete oil contained in the cellular membrane of their bodies, more especially round the kidneys, in the folds of the omentum, at the base of the heart, upon the surface of the intestines, and among many of the muscles. Fat varies in consistence, color, and odor, with the animal from which it is obtained. That of the carnivora is usually soft and rank-flavored; that of the ruminantia solid and nearly scentless. It is generally whitest and most copious in the well-fed young animal, and yellowish and more scanty in the old. That under the skin and surrounding the kidneys (*suet*) is also more solid than that in the neighborhood of the movable viscera. In the cetacea, or whale tribe, the fatty secretion assumes the form of oil. These variations in consistency depend upon the relative proportions of solid stearin and liquid olein present in the fat. — The vegetable fats are found in various parts of certain plants, but are generally most abundant in the seeds. They are extracted by simple pressure, or else by boiling. Two kinds of vegetable fat, namely, palm-oil and cocoa-nut oil, are extensively employed in the useful arts. — All fats are lighter than water. They are all soluble in ether, benzole, and turpentine, and may be mixed with each other in any proportion. — In former times, the fats of many animals were employed in pharmacy, but at present those principally used are lard and suet. In perfumery, in addition to these, beef marrow and bear's grease are employed. For both these purposes the crude material is cut into small pieces, and freed as much as possible from all extraneous membranes; after which it is placed in a boiler with water, and heated until it is completely fused, when the whole is strained, and allowed to cool very slowly. By

this means a cake of cleansed fat is obtained, which may be readily separated from any adhering water. — Fats and the fat-oils are best preserved by being run into glazed jars, and secluded from the action of the air. A little benzoic acid or gum-benzoin, dissolved in them by heat, will generally prevent, and in all cases greatly defer, the accession of rancidity. Nitric ether and its alcoholic solution act in the same manner. A few drops are not only sufficient to prevent rancidity, but will even destroy the disagreeable odor of rancid fat. When heated to remove the alcohol, they immediately become bright, clear, and scentless.

Fat-Lute, a mixture of pipe-clay and linseed-oil for filling joints.

Faucet, a spout with a peg or spigot for drawing liquor from a cask.

Fault, in geology, a fracture of strata accompanied by displacement. See Fig. 85.

Fauteuil, a large elbow-chair.

Favor, a bunch or knot of ribbons worn at weddings or other festive occasions.

Fayal Wine. See Azores.

Faying, in maritime phraseology, the union of two pieces so close that no intervening space occurs.

Fearnaught, a thick shaggy woollen stuff, used in England for draymen's coats, sailors' pea-jackets, etc. It is also known as dreadnaught.

Feast, a sumptuous repast; a public banquet or entertainment.

Feather [Fr. *plume;* Ger. *Feder;* It. *piuma;* Sp. *pluma*], the light portion of the wings and plumage of birds. The kinds most used for dress and military purposes are those of the ostrich, marabou, stork (Fig. 171), American or three-toed ostrich, emu, heron, birds-of-paradise, ibis, and domestic fowls. The tail-*F.* of the domestic cock, either dyed or in their natural colors, are much used for military plumes. Grebe and loon skins, and swan's down, are also used for muffs and trimmings of ladies' dresses. The most common, and the largest trade in *F.*, are those from the breast of geese, used for bedding, pillows, etc.

Fig. 171. — White Stork.

Imp. duty: *F.* and downs for bedding, free; ostrich, vulture, cock, and other ornamental crude *F.*, 25 per cent; the same, dressed, colored, or manufactured, 50 per cent; artificial and ornamental *F.*, or parts thereof, of whatever material composed, and not otherwise provided for, 50 per cent.

Ornamental F. The *F.*-worker, or *plumassier*, makes up *F.* into ornamental adornments, chiefly for head-dresses. Ostrich *F.* are those most prized, principally the purely white drooping plumes from the back and near the tail of the male bird. *F.* are prepared for ornamental purposes by scouring them with white soap-and-water (1 oz. to the pint), used hot; they are next well rinsed in several successive portions of pure water, and, after being drained and shaken, are, lastly, passed through water slightly blued with pure indigo, and dried out of the dust. When dry, the ribs are generally rubbed with a piece of glass having a curved notch in it, for the purpose of increasing their pliancy, and the filaments are curled by drawing them between the edge of a blunt knife and the ball of the thumb of the hand which holds it. Black, brown, or gray *F.* can now be bleached sufficiently to enable them to be dyed any required color. The process is as follows: The *F.* are first thoroughly washed with soap-and-water, to free them from any oil they may contain. They are next transferred to a bath composed of bichromate of potash dissolved in water, to which has been added a few drops of nitric or sulphuric acid. In this bath they rapidly lose their black, brown, or gray color, and become almost white. On being removed from this bath they are well rinsed in water, and are then fit to be dyed, even the most delicate color. Great care is required in the process, as the flue of the *F.* is apt to be destroyed, if kept too long in the bath. A bleached *F.* may be readily known by the yellow color of its stem. Other methods have been adopted, such as a bath of chloride of lime, peroxide of hydrogen, or sulphurous acid, etc., but the bichromate bath gives the best results. — *F.* are dyed rose-color by safflower and lemon-juice; red by Brazil-wood, followed by cudbear; blue by indigo; yellow by turmeric; alum being the usual mordant. Aniline colors, however, are fast superseding the others for superior work.

F. Beds. The best *F.* for this purpose are those of the goose, being more soft, elastic, and warm than others. The *F.* are said to be better if taken from the living than the dead bird; and this leads in some parts of England to the selection of regular seasons for *F.*-plucking. Poultry *F.*, such as those of the turkey, duck, and fowl, are used for cheaper beds and pillows. The preparation of the *F.* for the bed-stuffers involves processes of steeping in lime-water, draining, washing in clean water, drying upon nets, steaming, beating, etc. For the fine *down* of some birds (a kind of incipient *F.*) see Eider Down. This beautiful substance ought not to be lain upon, as it thereby loses its elasticity; it is properly used only in stuffing quilts. See Quill Pens.

Feather-Duster, a light brush made of feathers.

Feather-Edged, planks, or any rough substance, in which one side is much thinner than the other.

Feather-Flowers, artificial flowers made of feathers, which are used by ladies for head ornaments, and for fancy plumes and groups for rooms.

Fecamp. See France.

Fecula, the matter which subsides from cold water in which bruised or rasped vegetable substances have been washed. The *F.* obtained from the seeds of the cereals and leguminosæ, and from tuberous or bulbous roots, consists of nearly pure *starch.* In some cases the starch is associated with the green coloring matter (*chlorophyll*) and the narcotic principles of the vegetables which yield it. The green *F.* obtained by straining the expressed juices of the leaves and herbaceous parts of plants is of this character. The *F.* of all the amylaceous roots, rhizomes, and tubers, may be easily obtained, on the small scale, by rasping them, pressing, and working the pulp in cold water, and after straining the resulting milky liquid through a hair sieve, allowing it to settle. The sediment may be again washed by diffusion through clean cold water, and must be, lastly, collected, and dried out of the dust, and without artificial heat. The *F.* of narcotic plants for medicinal purposes is obtained by allowing the expressed juice to repose for 24 hours, and then decanting the clear portion, and drying the residue. Sometimes heat is employed. See Arrow-root, Starch, etc.

Fedelini, a kind of dried Italian paste in a pipe form, of a smaller size than vermicelli.

Fee, a gratuity or reward given to a professional man, as a physician or lawyer, for advice or service; a perquisite claimed by official personages under legal authority, or by prescription.

Feed, food for beasts, especially for horses and cattle; as oats, hay, corn, ground meals, etc. — The supply of material to a machine. — The motion or action which carries stuff forward to a machine.

Feed-Bag, a nose-bag for a horse, to contain his noonday feed.

Feeder, the stream supplying a river or canal. — A branch railroad running into the main-trunk

line. — A large head or supply of fluid iron to a runner or mould in heavy castings. — An auxiliary or a supplying part of a machine, that which leads along the stuff being operated upon.

Feed-Hand, a rod by which intermittent rotation is imparted to a ratchet-wheel.

Feeding-Bottle, a glass or india-rubber bottle for supplying milk or other liquid nutriment to an infant in the absence or indisposition of its mother.

In the artificial rearing of infants it is of importance that food should be given to them from a *F.-B.* By this means the natural method of taking nourishment is imitated, the muscles of the mouth and cheeks are brought into play, and the secretion of saliva is encouraged and increased. Almost all babies will take their food more readily by this method, their instinct teaching them to suck everything that is put into their mouths. To be satisfactory, a *F.-B.* must fulfil three indispensable conditions: it must be simple in construction and easily manageable; it must be capable of being readily cleaned, and in its use the milk must flow easily and without great effort on the part of the infant. The ordinary feeder in use at the present time consists of a flattened glass or india-rubber flask, closed at the mouth by a cap, which fits over the neck. An india-rubber tube passes through the cap, and is connected inside the bottle with a straight glass pipe. The other end of the elastic tube is attached to the teat, or mouthpiece, by means of a short hollow cylinder called the "union-joint," and the teat is firmly fixed to this by means of the shield. In this apparatus it is important that the channel through the tubes should be perfectly free. The point at which the channel is narrowest is the union-joint, which connects the moutapiece with the flexible tube. In a badly made bottle an impediment may exist at this point from carelessness in the manufacture, and may present a great obstacle to the ready passage of the fluid. Care also should be taken that the flexible tube passes completely through the cap, before it becomes connected with the glass pipe. This is very important, because, the glass tube being thus free to move, its end is able to sink to whichever side of the bottle is undermost, and therefore always remains below the level of the fluid. The method of connection of the cap with the neck of the bottle is not unimportant. It should not be too tight, or air will be prevented from entering the bottle to supply the place of the milk which is withdrawn. With badly made bottles, infants often have great difficulty in drawing up the milk, and can only do so by violent efforts, which soon exhaust their strength or their patience. There are two reasons why milk in these cases may not flow easily, — either the cap fits too tightly, so that air cannot enter with sufficient facility in proportion as the liquid contents become diminished, or the india-rubber forming the flexible tube is too thin, so that it collapses when suction is applied. In the first case, a small hole should be made through the cap, so as to allow a free admission of air, or if the bottle be closed at the mouth by a perforated cork, this may be slightly eased at the neck of the bottle, so as to fit less closely. In the second case, stouter india-rubber should be used in the construction of the tube. In weakly infants, or those much reduced in strength by acute disease, special attention should be paid to these points, as such children will often refuse to take the bottle, if they find any difficulty in drawing up the milk. Excellent *F.-B.* are now made by many different manufacturers, and are sold at prices which place them within the reach of the poorest. Among them may be mentioned, for its comfort, efficiency, and cleanliness, the *Maax F.-B.* (Fig. 172), recently patented in this country, and manufactured in Brooklyn by Mr. C. B. Dickinson. The *Alma Mater*, *Princess*, and other *F.-B.* were formerly largely imported from England, but, owing to the heavy duty charged on them, and the perfection attained by American manufacturers, this article is now but occasionally imported from Europe. *Imp.* duty: *F.-B.* in glass, india-rubber, and wood, 40 per cent.

Fig. 172. — Maax Feeding Bottle.

Feed-Pipe, a pipe which supplies the boiler of a steam engine, etc., with water.

Feed-Pump, the force-pump which supplies the boiler of an engine with a quantity of water equal to that removed in the form of steam, by the brine-pump, or other source of outlet.

For the common *F.-P.* has been substituted for the last few years a very ingenious contrivance (Fig. 173), invented by M. Giffard, known as *Giffard injector*, and which may be described as follows: A pipe, A, communicates with the upper part of the boiler, containing the steam; another pipe, B, is in communication with the lower part of the boiler, containing the water. These two pipes end at a small distance from each other, in the empty room, F, which communicates freely with the exterior air by lateral openings; there is, therefore, between them, an interruption of continuity, from which it results that the steam on one side and the water on the other can flow out from the boiler to the exterior by the two pipes A and B and through the chamber F. But the steam escaping with great force by the extremity C of the pipe A, hurries away with it by friction the air which surrounds it, and so produces a kind of vacuum; this vacuum is filled by water from a neighboring reservoir in which is immersed the

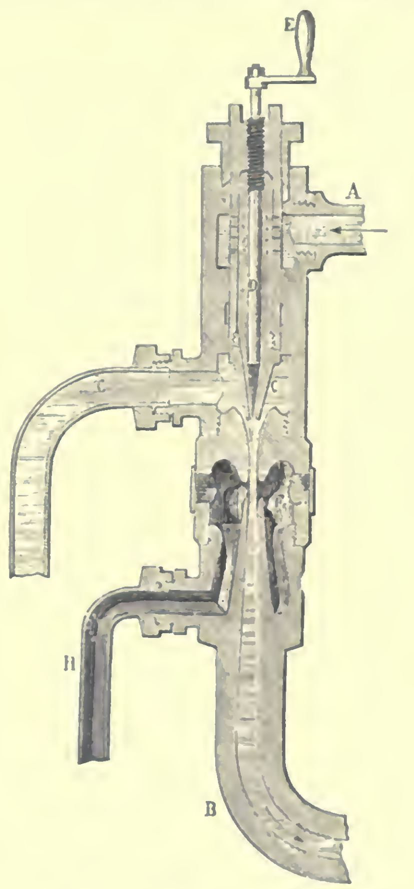


Fig. 173. — Feeding-Pump. (*Giffard injector.*)

small lateral pipe G, and that water aspirated through the pipe G is at its turn taken away by the flow of steam. From this results a continual aspiration of water through the pipe G, and at the same time a continual projection of a mixture of water and steam by the opening which is at the top of the chamber F. That mixture of water and steam constitutes an animated projectile of great velocity, which comes to engage itself directly in the superior extremity of the pipe B, and which not only opposes the escape of water from the boiler by that pipe, but drags it with it into the boiler. The boiler, therefore, is continually fed by the rushing of the water that the jet of steam at C attracts through the pipe G. A conically pointed rod, D, engaged into that part of the pipe A which terminates at C, is provided with a screw and handle which permit to lower or raise it, and so to narrow more or less the orifice of escape of the jet of steam, as to give it the desired intensity. The use of the pipe H is to collect the small quantity of water which might miss the orifice of entry of the pipe B.

Feejee or **Fiji Islands**, a group of 225 islands in the S. Pacific Ocean, 1,100 m. N. of New Zealand, situated in lat. 15° 45' to 19° 10' S., lon. 175° to 177° W., extending 300 m. from E. to W., and

240 m. from N. to S., 80 of which are said to be inhabited. The principal are Viti Levu (Great Feejee) and Vanua Levu (Great Land), each about 300 m. in circumference. Vegetation is remarkably luxuriant, the chief products being the bread-fruit tree, banana, plantain, cocoa-nut, sugar-cane, and arrow-root. Cotton, sugar, pearl-shells, indian corn, Bêche-de-mer, and copra and cocoanut-nut oil are the chief exports. The capital is Suva, on the S. coast of Viti Levu. These islands were formally ceded to Great Britain in 1874. The European pop. in 1877 amounted to 1,569.

Feet, a commercial name given to the 25 small plates of tortoise-shell, from the edges of the carapace, the superior plates being called "the head."

Fell, a skin; the hide of an animal.

Feller, a sewing-machine attachment for making a felled seam; that is to say, one in which two edges being run together are folded over and stitched.

Felling Timber. When a full-grown tree is cut down it is said to be felled; but this term is never applied to young trees or bushes, undergrowth, or hedges, which are said to be rooted out or cut over. Much has been written respecting the proper season for felling trees; some arguing in favor of midwinter and others in favor of midsummer. The question principally turns upon the quantity and the value of the soft or outer wood in the trunk of the tree to be felled, known by foresters and carpenters as the sap. As this sap or outer wood is the only portion of the trunk in which the sap or juices of the tree circulate, it is evident that if no value be set upon it the tree may be cut down at any season, because the truly valuable part of the trunk, the mature timber, is impermeable to the sap in its ascent through the soft wood, and is, therefore, in the same state at every season of the year. On the other hand, where much value is attached to the soft or outer wood, where this outer wood is wished to be made as valuable as possible, or where, as in the case of comparatively young trees, the greater part of the trunk consists of sap-wood, felling ought to take place when there is least sap in the course of circulation. This season is, without doubt, midwinter, which, all other circumstances being equal, is unquestionably the best season for felling timber; the next best being midsummer, when the sap is chiefly confined to the young shoots, the circumference of the soft wood, and the bark; as the worst is the spring, just before the development of the buds, when the tree is fullest of sap, and receiving constantly fresh supplies from the root, and the autumn, immediately before the fall of the leaf, when there is a superabundance of sap, from its being as it were thrown out of employment by the falling of the leaf. In general, all the soft woods, such as the elm, lime, poplar, willow, etc., should be felled during winter; hard woods, like the oak, beech, ash, etc., when the trunks are of large size, and valued chiefly for their heart-wood, may be felled at any time.

Fellmonger, a dealer in hides; a dresser of skins; a part of the business of the fellmonger is to separate the wool from the sheep's skin, the wool being sold to the wool-staplers, and the pelts, or stripped skins, sent to the leather-dressers and parchment-makers.

Felloe, the rim of a wheel, or one of the angular segments. See FELLY.

Fellow, to match; one of a pair.

Fellow-Craft, a freemason of the second rank; one above an entered apprentice.

Fellowship, a companionship or guild; an association.

Felly, a segment of the rim of a wooden wheel. When the perimeter is in one or two portions of bent stuff, it is a *rim*. See FELLOE.

Felspar, a very abundant silicious mineral, of which there are several varieties, displaying elegant and varied iridescent colors. So far as it relates to manufacturing processes, it is chiefly valuable in being the basis of certain kinds of clay, especially the *kaolin clay* used in the porcelain manufacture.

Felt [Fr. *feutre*; Ger. *Filz*], a kind of stuff resembling coarse cloth, made of hair or wool, without spinning or weaving. The fur of the hare, rabbit, seal, beaver, and the wool of the sheep, are the materials chiefly used for making *F.* The hairs and loose flocks of wool are thoroughly mixed together by an operation called *bowing*, which depends on the vibrations of an elastic string; when, in consequence of their anatomical structure, they become matted together. This effect cannot be produced with silk, cotton, flax, or hemp. *F.* is used for cloth, clothing, socks, slippers, boot and shoe soles and insoles, hats, gloves, carpets, table-covers, saddle-cloths, elastic blankets for printing-presses, lining between the planking and copper sheathing of ships, polishing-wheels, hammers of grains, covers of books, etc.—*Felted sheathing*, for covering steam-boilers, etc., is made of cheap woollen refuse, worked up into a kind of pulp, and beaten to the requisite degree of thinness and hardness.—*Roofing felt* is similar to sheathing felt in susbtance, but is saturated with asphalt, pitch, or coal-tar, to render it impervious to water.

Imp. duty: adhesive felt for sheathing vessels, free; felt exclusively of hair, 30 per cent; roofing felt, 20 per cent; endless felts, for paper or printing machines, or "machine blanketing," 20 cts per lb. and 35 per cent; carpeting felt (see CARPET); hatters' felting (see WOOLLENS, HATS OF).

Felting is the process of matting or uniting different substances into one compact mass. The first step towards making felt is to mix, in the proper proportions, the different kinds of fibres intended to form the stuff; and then, by the vibratory strokes of the bowstring, to toss them up in the air, and to cause them to fall as irregularly as possible upon the table, opened, spread, and scattered. The workman covers this layer of loose flocks with a piece of thick blanket-stuff slightly moistened; he presses it with his hands, moving the hair backward and forward in all directions. Thus the different fibres get interlaced, by their ends pursuing ever tortuous paths; their vermicular motion being always, however, root foremost. As the matting gets denser, the hand pressure should be increased, in order to overcome the increasing resistance to the decussation. A first thin sheet of soft, spongy felt being now formed, a second is condensed upon it in like manner, and then a third, till the requisite strength and thickness be obtained. These different pieces are successively brought together, disposed in a way suitable to the wished-for article, and united by continued dexterous pressure. The stuff must be next subjected to the fulling-mill.

Felt Cuttings, clippings from the manufacture of druggets, caps, leggings, etc. They are collected, sold, boiled down, felted over again, and made into felt caps, etc.

Felted Sheathings. See FELT.

Felt Hats are made of felted fabrics, whether of fur, hair, or wool.

Felting Furs are furs employed in hat-making, such as beaver, muskrat, etc.

Feltings, the collective name for felt fabrics.

Felucca, a small coasting vessel in the Mediterranean, carrying two masts with lateen sails; often propelled with oars as well as sails.

Feme Sole Trader, in law phraseology, a married woman who trades and deals on her own account independently of her husband.

Fen, a moor or marsh.

Fence, a rail or bordering protection for a field, or estate, to keep off intruders; live fences are hedges of quickset. — In wood-working, an adjustable guard-plate or edge on a gauge, by which the distance of the groove from the guide-edge is regulated. — The arm of the hammer-spring of a gun-lock. — A slang term for a receiver of stolen goods. — To thrust, parry, or guard off a blow.

Fencing, wooden or metallic casing, as a protection for machinery in factories, to prevent injury to the workmen about the machinery.

Fend, to ward off.

Fender, a thick piece of rope or solid wooden guard or protection hung over the side in vessels, to prevent injury to the bulwarks, etc., by chafing or collision. — A solid or open ornamented metal casting placed before a fireplace, for enclosing the cinders and ashes of the grate.

Fenks, the ultimate refuse of the blubber of the whale, which forms an excellent manure when available, and might be used in the manufacture of Prussian blue, and also for the production of ammonia.

Fennel, an umbelliferous plant, the *Anethum fœniculum dulce*, cultivated in Europe as a pot-herb, and for the seeds and essential oil obtained from them. The seed is used in the manufacture of gin, and in medicine as a carminative. Another species, the common fennel, *Fœniculum officinale*, is cultivated in gardens as a garnish for fish, etc., and as a pot-herb for flavoring sauces. The Giant Fennel, *Ferula communis* (Fig. 174), a native of the Mediterranean region, growing to a height of 10 to 15 feet, is very ornamental in single specimens in a large garden.


Fig 174. — Giant Fennel.

Fenugreek, a plant, native of the S. of France, the *Trigonella fœnum Græcum*, the seeds of which are emollient. Poultices made of the flour are employed in veterinary practice.

Fer-blanc, the French word for tin.

Ferding, a small money of account in the Russian ports of the Baltic; the 80th part of the rix-dollar.

Ferment, the substance which is essential to the process of fermentation. It is either naturally present in the fermentable juice, as in the grape, or it is added, as in the manufacture of beer, where *yeast* constitutes the ferment. Ferments are of an albuminous or glutinous character; the presence of nitrogen seems essential in their composition, hence they are classed by chemists among azotized compounds, which in a moist state putrefy and suffer decomposition. It seems, however, now proved that fermentation is excited by living organisms, — fungi and infusoria. See Compressed Yeast and Fermentation.

Fermentation is a peculiar chemical metamorphosis of a complex organic substance, by a transposition of its elements and the agency of an external disturbing force. *F.*, according to the theory proposed by Liebig, is a metamorphosis by which the elements of a complex molecule group themselves so as to form more intimate and stable compounds. It is excited by the contact of all bodies the elements of which are in a state of active decomposition or *F.* The substances which promote *F.* are termed *ferments*, and among these the principal are gliadin, gluten, vegetable albumen, and all nitrogeneous substances in a state of spontaneous decomposition or *F.* *Yeast*, the ferment most commonly employed for inducing the vinous *F.*, is such a substance in an active state of putrefaction, and whose atoms are in continual motion. Putrefying animal substances are equally capable of exciting the same action. If we add to a solution of pure sugar an albuminous substance, a caseous or fleshy matter, the development of yeast becomes manifest, and an additional quantity of it is found at the end of the operation. Thus, with nourishment, ferment engenders ferment. It is for this reason that a little fermenting must, added to a body of fresh grape-juice, excites *F.* in the whole mass. These effects are not confined to alcoholic (vinous) *F.* The smallest portion of sour milk, of sour dough, or sour juice of beet-root, of putrefied flesh and blood, occasions like alterations in fresh milk, dough, juice of beet-root, flesh and blood. But further, and which is a very curious circumstance, if we put into a liquid containing any fermenting substance another in a sound state, the latter would suffer decomposition under the influence of the former. If we place urea in the presence of beer-yeast, it experiences no change; while if we add it to sugar-water in a fermenting state, the urea is converted into carbonate of ammonia. We thus possess two modes of decomposition; the one direct, the other indirect.

Vinous F. and Acetous F. When certain vegetable substances are dissolved in water, and subjected to a due temperature (between 65° and 85°), they undergo a series of changes which terminate in the production of alcohol or spirit; these changes constitute the phenomena of *vinous F.* Sugar and some ferment are essential to the process, and during the formation of the alcohol the sugar disappears, and carbonic acid is more or less abundantly evolved. The simplest case of vinous *F.* is that of *must*, or of the expressed juice of the grape, which, when exposed, either in close or open vessels, to a temperature of about 70°, soon begins to give off carbonic acid, and to become turbid and frothy; after a time a scum collects upon the surface, and a sediment is deposited; the liquor which had

grown warm gradually cools and clears, loses its sweet taste, and is converted into *wine*. The chief component parts of must are water, sugar, mucilage, gluten, and tartar. During the *F.* carbonic acid escapes, the sugar disappears, and with it the greater part of the mucilage: the gluten chiefly forms the scum and a portion of the sediment; and the tartar, originally in solution, is thrown down in the form of a colored deposit. It appears, therefore, that the new products, which are *alcohol* and *carbonic acid*, are principally formed at the expense of the sugar; and Gay Lussac's experiments have shown that 45 lbs. of sugar are resolved, in the process of *F.*, into 23 of alcohol and 22 of carbonic acid. Sugar and water alone will not ferment; the ingredient requisite to the commencement of the change is the gluten, which absorbs in the first instance a little oxygen from the air, becomes insoluble, and induces the subsequent changes. The reason why grapes never ferment till the juice is expressed, seems to depend upon the exclusion of air by the husk or membranes; and if grapes be bruised in a perfectly close vessel, carefully excluding oxygen, the juice undergoes no change; so that the mere breaking down of the texture of the fruit is insufficient. But a very short exposure of the pulp to air is sufficient to induce that change in the juice which leads on to *F.*, and which is afterward independent of the further contact of air, the evolution of carbonic acid being exclusively referable to the decomposition of sugar. In *beer*, the alcohol is derived from the sugar, original and produced, of the malt. When wine is exposed to air and a due temperature, a second *F.* ensues, which is called *acetous F.*, and which terminates in the production of *vinegar*. During this process oxygen is absorbed, and more or less carbonic acid in most cases evolved; but the apparent cause of the formation of vinegar is the abstraction of hydrogen from the alcohol, so as to leave the remaining elements in such proportions as to constitute *acetic acid*. Thus alcohol is theoretically constituted of charcoal, water, and hydrogen, and acetic acid of charcoal and water only; the oxygen of the air, therefore, converts the hydrogen of the alcohol into water, and so effects the change into vinegar.

A very remarkable circumstance connected with *F.* is that it is always accompanied by the development of microscropic living organism,—fungi and infusoria. "So constantly, indeed, is this the case, that many chemists and physiologists regard these organisms as the existing cause of *F* and putrefaction; and this view appears to be corroborated by the fact that each particular kind of *F.* takes place most readily in contact with certain living organisms." (*Fownes.*) Thus the vinous or alcohol-producing *F* is accompanied, or caused, by two fungi, called *Torula cerevisiæ* and *Penicillium glaucum*; the acetous or vinegar-producing *F.* by *Torula aceti*; the lacteous *F.* (souring of milk) by *Penicillium glaucum*; etc. Of late years these latter views as to the cause of *F.* have been accepted by most of the scientific world, notwithstanding the opposition they experienced from so powerful an antagonist as Liebig. From the researches of Pasteur, the distinguished author of the modern theory of *F.*, as opposed to the chemico-physical theory of Liebig, it appears that when yeast is placed in a solution of sugar and water, or in a solution of sugar and water containing albuminous substances, under proper conditions as to temperature, the *F.* that ensues is due to the process of growth taking place in the yeast plant; the new cells of which, in assimilating part of the sugar and converting it into cellulose and fat, cause, at the same time, the breaking up of the sugar molecule, and resolve it into the more stable combinations of alcohol and carbonic acid. In order that the ferment of fungus should grow it is essential that, in addition to the cellulose and fat, it should be supplied with ammoniacal salts and soluble phosphates. These are generally present in the liquid about to be fermented; but when yeast is added to pure sugar and water it lives at the expense of the sugar, and of the nitrogeneous and mineral substances contained within itself. Speaking of the influence of oxygen on the development of yeast on alcoholic fermentation, Pasteur states that ready-formed yeast can germinate and grow in a liquid containing sugar and albuminous matters, even when oxygen is completely excluded. The quantity of yeast formed, however, in this case is but small, and the *F.* goes on slowly; nevertheless, a large quantity of sugar disappears (sixty to eighty parts to one part of yeast). If the air has access to a large surface the *F.* goes on quickly, and a much larger quantity of yeast is formed in proportion to the quantity of sugar which disappears. In this case, also, oxygen is absorbed by the yeast, which grows quickly, but does not act so decidedly as a ferment, inasmuch as only four to ten parts of sugar disappear for one part of yeast produced. When the air is excluded the same yeast again acts as a powerful ferment. Pasteur, therefore, infers that yeast which acts as a ferment in the absence of air abstracts oxygen from the sugar, and that upon this deoxidizing power its action as a ferment depends. The violent activity of the yeast at the commencement of the *F* is due to oxygen dissolved in the liquid. In liquids containing albumen (yeast and water, etc.), yeast likewise grows, though sparingly, even if the solution does not contain a trace of sugar, provided there is a sufficient access of air. But if the air is excluded this does not take place, even though the liquid may contain, besides albumen, a non-fermentable sugar, such as milk sugar. The yeast formed in a liquid not containing sugar possesses all the properties of a ferment, and excites *F.* in a solution of sugar excluded from the air. Similarly, Pasteur regards putrefaction as a kind of *F.*, set up and maintained by an animal organism, or ferment belonging to the genus *Vibrio*. Putrefaction, when taking place in contact with the air, is always accompanied by decay or *eremacausis*. The abandonment of the old theory as to the nature of eremacausis, viz, that it consisted in the gradual combustion of decaying organic matters by atmospheric oxygen, has been necessitated by the experiments of Pasteur, Schröder, and others, which have conclusively established the facts that organic substances are not oxidized by perfectly pure air, and that their decomposition and subsequent destruction are due to the presence in the air of the sporules or seeds of certain low organisms. Pasteur cites numerous instances corroborative of the statement that perfectly pure oxygen fails to affect, save to a very limited extent, organic substances. In one case an aqueous infusion of yeast mixed with sugar was enclosed in a sealed flask with double its volume of air, which had been previously depurated by being made to pass through a red-hot tube. At the end of three years the liquid (which had during part of the time been kept at a temperature of from 25° to 30° C.) was found to be perfectly fresh and transparent, and the air when examined gave 18.1 vols. of oxygen, 80.5 vols. of nitrogen, and 1 4 of carbonic acid. Under the same conditions urine and milk, whether fresh or previously boiled, showed minute traces only of oxidation; crystals of uric acid and phosphates formed in the urine, but the milk was unaltered, having preserved its alkaline reaction, and showed no disposition to curdle. Very different, however, was the result, when either of the above substances was enclosed with ordinary air. It was then found that in a few days the whole of the oxygen was absorbed, carbonic acid being at the same time simultaneously formed. A certain quantity of moistened oak sawdust kept in contact with ordinary air for a fortnight was found at the end of that time to have absorbed 140 cubic centimètres of oxygen; whilst the same amount of sawdust enclosed with an equal volume of purified air had removed only a few cubic centimètres of the gas in a month. In the former experiment a microscopic film of mycelia and spores of Mucidineæ formed on the sawdust. From numerous experiments of a like nature with the above, and attended with analogous results, chemists and physiologists now generally regard eremacausis as effected by agencies similar in character to those which produce *F.* and putrefaction.

The entire absence of the exciting causes—warmth, air, and moisture—leaves even those substances which under ordinary circumstances are most liable to change in a state in which they may remain for an almost indefinite period without perceptible alteration. Thus, animal substances in a frozen or dry state do not undergo decomposition, nor does a solution of sugar or the juice of grapes (must) when perfectly excluded from the air; but on the mere exposure of these substances to warmth, moisture, or atmospheric air, putrefaction or *F.* immediately commences. Remove the cork from the bottle of "capillaire" on the parlor sideboard, or pierce the skin of one of the grapes on the dessert table with a needle, and these bodies, which would have otherwise suffered no change for weeks, or even months, will soon exhibit symptoms of spontaneous decomposition. The knowledge of this fact has been practically applied to the preservation of animal and vegetable substances for food. Even the most putrescible of these may be preserved for an unlimited period by enclosure in metallic cases, or glass bottles, from which the air has been completely removed and excluded.—The important duties which *F.* or putrefaction performs in the economy of our globe, and in several of the arts of life and civilization, have long rendered the development of its principles an object of the highest interest and importance, both in a scientific and practical point of view. In its most extended sense, this subtile process of nature, though occasionally productive of injurious effects, may be regarded as one of the most necessary and beneficial with which we are acquainted. Like the labors of a scavenger, it speedily removes from the surface of our globe those matters which would otherwise remain for some time without undergoing decomposition. It either dissipates in air, or reduces to more fixed and useful forms of matter those organic substances which, by their presence, would prove noxious, or, at all events, useless to the animal and vegetable kingdoms. It is the giant power that cleans the Augean stable of nature, at the same time that it provides some of the most esteemed articles of utility and luxury for the well-being and enjoyment of man.

Fermented Liquor, a name applied in commerce, and in internal revenue laws, to beers, ales, porters, and other similar liquors obtained by subjecting certain grains, fruits, or vegetables to the process of fermentation, the proportion of alcohol in such liquors being much less than in those which are obtained by distillation.

Fernandina. See FLORIDA.

Fernandina, Ferrandine, a stuff made of silk and wool.

Ferret, an animal of the weasel tribe (*Mustela fero*), kept for the purpose of destroying rats, etc., in corn-stacks and out-buildings. — In glass-making, an iron used to make the rings at the mouths of bottles, or to try the melted matter. — In French, a tag for a lace or point.

Ferrotype, a photographic process which is substantially as follows: A plate of sheet-iron, after being covered with a surface of black Japan varnish, is immersed in collodion, and after a time in the silver solution. It is then placed in the holder, and exposed in the camera.

Ferrule, a metal ring or case, fixed on the handle of a tool, or at the end of a stick or umbrella, to prevent the wood from splitting.

Ferry, the place in a river, lake, or harbor where a boat plies for the conveyance of goods or passengers from shore to shore. "In the U. States, ferries are established by legislative authority, exercised either directly or by a delegation of powers to courts, commissioners, or municipalities. Without such authority no one, though he may be the owner of both banks of the river, has a right to keep a public ferry. The owners of ferries are common carriers, and liable, as such, for the carriage of the goods and persons that they receive on their boats. They may determine when and how often, and upon what terms, their boats shall cross the river, and what they will transport; but all these things they must do by general rules, without favoritism or arbitrary exception." — *Zell's Encyclopædia*.

Ferry-Boat, a boat employed in crossing a ferry.

Fertile, rich or fruitful; having abundant resources.

Fertilizer, a manure; an application to the soil, organic or inorganic.

Festival, a holiday; a day set apart for rejoicing, public or private.

Festoon, a kind of ornamental hanging drapery, suspended in a curve with ends passed over; a garland of flowers.

Fetch, to obtain or bring, as a price.

Fetlock-Boot, a protection or support for the pastern joints of horses.

Fetter, a shackle or chain for the feet; iron links for spanning horses' feet, when grazing in open grounds, to prevent them straying to a distance.

Feu, the French word for fire.

Feuillage [Fr.], foliage; a row of leaves; branched work.

Feuille [Fr.], a leaf; also, a leaf, or sheet of paper.

Feuille-Morte, the color of a faded leaf.

Feuilleton, that part of a French newspaper devoted to literary or dramatic criticism.

Feuillets, the projecting points of the triangular facets in a rose-cut diamond, whose bases join those of the triangle of the central pyramid.

Feuillette [Fr.], a half-hogshead.

Feverfew, the popular name of *Pyrethrum parthenium* (Fig 175), a wild plant, a decoction of which is, in some countries, a favorite popular remedy for slight fevers. It contains much tannic acid, and in Germany has been usefully employed in tanning and currying leather.

Fez, a red cap, made of felt, worn in Turkey, Greece, etc.

Fiacre, a French hackney-coach.

Fiars, the average prices of grain legally fixed for the year in Scotland.

Fiasco, a liquid measure of Italy; for wine about four pints, and for oil somewhat less.

Fibre. This term, as popularly and commercially used, includes the hair and wool of quadrupeds, the threads of the cocoons of silk-worms, etc., the fibres of the leaves of plants and of their inner bark, the elongated cells or hairs connected with the seeds of plants, and the ordinary materials used in making cordage and textile fabrics. Mineral substances are called fibrous in structure, even when it is impossible to detach the apparent fibres. The only fibrous mineral which has been used for textile fabrics is asbestos (q. v.), but that only to a very limited extent. The animal substances used are divided into two classes, — the first including hair and wool, and the second the silk of cocoons. Nearly all textile fabrics are made from the first, and the wool of the sheep is the most important division of the class. The hair of the goat, alpaca, camel, bison, and other animals is also used. The hair of most animals is, however, in general, too short to allow of its being used for textile manufacture. The vegetable kingdom yields the largest number of useful fibres, which are obtained from natural orders very different from each other. From exogenous plants, fibres are obtained from the inner bark, as in the case of flax, hemp, etc., and from the hairs of the fruit, as in cotton. In endogenous plants, the fibre is sometimes obtained from the fruit, as in the cocoa-nut fibre. The spathe of some palms is also used. Some of the slender palms, called rattans, and the bulrush, etc., are much used, on account of their fibrous nature, for wicker-work, chair-bottoms, and similar purposes. The most valuable fibres obtained from endogenous plants come from the leaf or leaf stalk. The fibres of the bark of exogens are readily separated, usually by steeping or continually moistening with water. As this process injures the color of endogenous substances, the fibres are generally separated by beating or passing between rollers. Fibres obtained from fruits, as cotton fibre, like the wool and hair of animals, exist naturally in a separate state, and only require to be collected and cleaned. Among the useful vegetable fibres those of flax, hemp, and cotton have long held the first place.

Fig. 175. — Feverfew.

The principal additions, of late years, have been New Zealand flax, jute, Sunn or Sunn hemp, coir, Pita flax, Abaca or Manilla hemp, Chinese grass, Esparto, Alfa, American jute, etc. All the useful fibres are noticed under their particular names.

Fibula, a needle used by surgeons for sewing up wounds.

Fichu [Fr.], a sort of three-cornered neckerchief worn by ladies.

Fictile, moulded into form by art; manufactured of clay by the potter.

Fid, a tapered wooden pin, used by seamen in splicing large ropes, opening eyes, or holes, etc.; an iron support passed through a hole in the heel of a mast.

Fiddle, a stringed musical instrument. See VIOLIN.

Fiddle-Block, a block with two sheaves, one over the other, the lower one smaller than the upper.

Fiddle-Bow, Fiddle-Stick, the stringed bow with which a fiddler draws sound from his instrument.

Fiddle-Wood, a durable wood used for mills framing, carriage-wheels, etc.; the produce of *Citharexylum melanocardium*, a useful timber-tree of the West Indies.

Field, a portion of arable land.—The range of an optical instrument; the space visible in it at one view.

Field-Bed, a portable or folding camp-bed.

Field-Book, a land-surveyor's plotting-book, in which the angles, distances, stations, etc., are noted down for mapping or reference.

Field-Gun, a piece of cannon mounted on a two-wheeled carriage, and drawn by horses, which can be carried into the field of battle, and throws a shot of from 6 to 12 pounds.

Field-Roller, a wooden or iron cylinder, drawn upon a ploughed field to mash the clods and level the ground.

Fife, a very small wooden flute or pipe, giving acute piercing sounds, and used as an accompaniment to the drum.

Fife-Rail, the rail round a ship's mast.

Fig [Fr. *figue;* Ger. *Feig;* It. *ficho;* Port. *figo;* Sp. *Higo*], the fruit of *Ficus carica*, a small tree, rarely more than 20 feet high, indigenous to Asia Minor and Syria. The fig consists of a pulp containing a number of seed-like pericarps enclosed in a rind; and is of various colors, from deep purple to yellow, or nearly white, with a sweet taste. From the ease with which this nutritious fruit can be preserved, it was probably one of the earliest objects of cultivation, as may be inferred from the frequent allusions to it in the Hebrew Scriptures. The tree is now cultivated in all the Mediterranean countries, but the larger portion of our supply of figs comes from Asia Minor, Spain, and the South of France. Those of Asiatic Turkey are considered the best. The trees usually bear two crops, one in the early summer from the buds of the last year, the other in the autumn from those of the spring growth; the latter forms the chief harvest. When ripe the figs are picked and spread out to dry in the sun, those of better quality being much pulled and extended by hand during the process. Thus prepared, the fruit is packed closely in barrels, rush baskets, or wooden boxes, for commerce. The best kind, known as *elemi*, are shipped at Smyrna, where the pulling and packing of figs form one of the most important industries. This fruit still constitutes a large part of the food of the natives of Western Asia and Southern Europe, both in the fresh and dried state. Medicinally the fig is employed as a gentle laxative, when eaten abundantly often proving useful in chronic constipation; it forms a part of the well-known "confection of senna." Cut open, the fruit is a popular cataplasm for boils and sores, an application as old as the days of Hezekiah. It is recommended as a demulcent in disorders of the throat, being given in the form of decoction. The fig is grown for its fresh fruit (eaten as an article of dessert) in all the milder parts of Europe; and in the U. States, with protection in winter, succeeds well as far north as Pennsylvania. *Imp.* duty, 2½ cts. per lb.; preserved in sugar, brandy, or molasses, 35 per cent.

Fig-Cake, a preparation of figs and almonds, worked up into a hard paste, and pressed into round cakes like small cheeses, which is vended about the streets.

Figure, a number.—An artist's model.—Any representation made of things in wood, stone, or other solid material.—Amount, price, value; as, the goods were sold at a high figure.—To goffer, to emboss, to ornament a stuff with gold, silk, etc.

Figure-Head, a carved bust, statue, or full-length figure, placed over the cutwater or bow of a ship.

Figured Muslin, a thin fabric in which a pattern, design, or representation is wrought. See MUSLIN.

Figure-Weaving, a process differing from plain-weaving; patterns or designs being produced in the damask, velvet, or other stuff by employing threads of different colors or of different appearance, in the warp or in the weft.

Fil [Fr.], thread, hair, wire; a small twist of silk, hemp, or flax.

Filament, a string; a long fibre or fine thread.

Filasse [Fr.], hemp or flax ready to be spun.

Filature, a silk-yarn, or cotton-twist, manufactory; a workshop where silk is reeled from cocoons and spun.

Filbert, the fruit of the cultivated hazel (*Corylus avellana alba*). The filbert is not thicker than the common nut, but is at least double the length, with a corresponding kernel. The largest of the species is the cob-nut, which is round. What is called the cluster-nut differs from the others only in the fruit being produced in large clusters at the ends of the branches. Filberts are imported to the U. States, principally from Palermo and Naples, in bags of about 195 lbs.; and from France, in barrels or bags. *Imp.* duty, 3 cts. per lb.

Filch, to steal or purloin.

File [Fr. *lime;* Ger. *Feile;* It. *lima*], an instrument of iron or forged steel, used to polish or smooth metals, and other hard bodies. A file differs from a *rasp* (which is chiefly used for working wood, horn, and the like) in having its teeth cut with a chisel whose straight edge extends across its surface, while the teeth of the rasp are formed by solitary indentations of a pointed chisel. According to the form of their teeth, files may be *single-cut* or *double-cut;* the former have only one set of parallel ridges (either at right angles or at some other angle with the length); the latter (and more common) have a second set cut at an angle with the first. The double-cut file presents sharp angles to the field surface, and is better suited for hard metals. Files are also classed according to fineness of teeth, being known (in order of increasing fineness) as *rough, bastard, second-cut, smooth,* and *superfine*, or *dead smooth*. The shapes of files present almost endless varieties. Common forms are: the *flat* file, of parallelogram section, with uniform breadth and thickness, or tapering, or

"bellied"; the *four-square* file, of square section, sometimes with one side "safe," or left smooth; the so-called *three-square* file, having its cross section an equilateral triangle; the *half-round* file, a segment of a circle; the round or *rat-tail* file, a circle; the last three are generally tapered. The *float* file is like the *flat*, but single-cut. There are many others. Files vary in length from three quarters of an inch (watchmakers') to two or three feet and upwards (engineers'). The length is reckoned exclusively of the spike or tang which enters the handle. Most files are tapered; the *blunt* are nearly parallel with larger section near the middle; a few are parallel. The *rifflers* of sculptors and of a few other files are curvilinear in their central line.

Cast-steel is the material chiefly used for *F.*, though the larger and rougher varieties are sometimes made from blister-steel. In manufacture, the blanks are forged from bars that have been tilted or rolled as nearly as possible to the sections required; they are then annealed with great care, and when sufficiently softened are taken out, straightened, if necessary, with hand hammers, and then rendered clean and accurate in form by filing or grinding. They are now ready for cutting. In this process, as performed by hand, the cutter sits before a square stake or anvil, on which the blank, slightly greased, is held (having its tang towards him) by means of two leather straps passed round its ends, and held fast below, one by each foot. He holds in his left hand a short chisel (the edge of which always exceeds the width of the *F.*, placing it on the blank with a slight inclination from him, and beginning near the further end. He strikes the chisel sharply with a hammer; an indentation is thus made, and the steel, slightly thrown up on the side next the tang, forms a ridge. The chisel is then transferred to the uncut surface, and slid from the operator till it reaches the ridge just made; thus the position of the next cut is determined; the chisel is again struck, and so on. (The end part of the *F.* is dealt with separately.) The workman seeks to give his blow as uniformly as possible. Sixty to eighty cuts are made in one minute. After finishing the first *course* of cuts, he proceeds, if the *F.* is to be double-cut, to make the second course, the cuts of the latter being generally somewhat finer. Thus the surface is covered with teeth inclined towards the point of the *F.* If the *F.* is flat and is to be cut on the other side, it is turned over, and a thin plate of pewter placed below it to protect the teeth. Triangular and other *F.* are supported in grooves in lead. In cutting round and half-round *F.*, a straight chisel is applied as tangent to the curve. The round face of a half-round *F.* requires eight, ten, or more courses to complete it. The *F.* is next hardened. Being first covered with a paste to protect the teeth from the direct action of fire, etc. (for instance, passed through beer-grounds to make it sticky, then through a mixture of common salt with roasted and pounded cow's hoof), it is heated to an even red heat, and then suddenly cooled by plunging in cold water or brine. It is removed before cooling throughout, that it may be straightened if necessary (which is done by pressure). Then it is cooled in oil. The tang is next submitted to a softening process, and the *F.*, after being wiped, and the teeth brushed clean, is ready for fixing into the handle and for use.

In England *F.* are chiefly made in Sheffield and Warrington, those of the latter place being generally known as Lancashire *F.* It is remarkable that while many other operations that appear more difficult than *F.*-cutting are now effected by machinery, and while numerous *F.*-cutting machines have been invented, the work continues (in England) to be largely done by hand. This is perhaps partly due to strong opposition on the part of operatives to introduction of machinery, and also to a foolish prejudice in favor of hand-cut *F.* (machine-cut *F.*, indeed, are not unfrequently sold as hand-cut), but probably also to the problem of cutting *F.* by machinery being really somewhat difficult. In most of the machines invented for that purpose, the idea has been to construct an iron arm and hand to hold the chisel, and a hammer to strike the blow, and so to imitate, as closely as possible, the manual process. *F.*-making by machinery is extensively and successfully practised in the U. States, which seems to indicate that much of the failure experienced in England is due to the defect in their machinery, of producing extreme regularity in the teeth. This gives rise to complaints by English artisans about *F.* "running in grooves," "chattering," etc. The grooves produced by the *F.* (if double-cut especially) at the beginning of its movement are deepened as it is moved further. With irregular teeth, on the other hand, such as are found in all hand-made *F.*, the grooves made in the first instance have their sides cut away as the *F.* is advanced. The Nicholson *F.* Co., in Providence, Rhode Island, have used, with large and increasing success, a machine which imitates, to some extent, this irregular result of the hand process, cutting the *F.* so that no two spaces are found exactly alike in the entire length. The filing of a flat surface perfectly true is the test of a good filer; and this is no easy matter to the beginner. The piece to be operated upon is generally fixed about the level of the elbow, the operator standing, and, except in the case of small *F.*, grasping the *F.* with both hands, the handle with the right, the further end with the left. The great point is to be able to move the *F.* forward with pressure in horizontal straight lines; from the tendency of the hands to move in arcs of circles, the heel and point of the *F.* are apt to be alternately raised. This is partially compensated by the bellied form given to many *F.* (which also counteracts the frequent warping effect of the hardening process, by which one side of a flat *F.* may be rendered concave and useless). In bringing back the *F.* for the next thrust it is nearly lifted off the work. Further, much delicacy and skill are required in adapting the pressure and velocity, ascertaining if foreign matters or filings remain interposed between the *F.* and the work, etc. *F.* can be cleaned with a piece of the so-called *cotton-card* (used in combing cotton-wool) nailed to a piece of wood. In *draw-filing*, which is sometimes resorted to, to give a neat finish, the *F.* is drawn sideways to and fro over the work. New *F.* are generally used for a time on brass or cast-iron, and when partially worn they are still available for filing wrought iron and steel.

Imp. duty: *F.* and *F.* blanks, rasps and floats, all not over 10 inches long, 10 cts. per lb. and 30 per cent; the same, over 10 inches long, 6 cts. per lb. and 30 per cent.

Filet [Fr.], a small thread or fibre; a string or lace.

Fileur [Fr.], a spinner.

Filibuster, a sea-robber; an American pirate.

Filigree, Filigrane, a style of ornamental work in gold or silver, wrought in little threads of the metal intertwisted in eccentric forms and patterns. It is of Eastern origin, and was first introduced into Europe by the Italians. In the East, Sumatra and Java have been celebrated for the high excellence to which they have arrived in the prosecution of this art. When the gold or silver has arrived to a molten state, it is drawn into wire on an anvil, and then twisted. After twisting it is hammered down again into a flat state, and formed into the shape of flowers and leaves. When the *filigree* is finished, it is cleansed by boiling in water with common salt and alum, or occasionally lime-juice. This work is chiefly done in Malta, Sardinia, and the Ionian Islands.

Filings, fragments or raspings of metal, ivory, etc.; particles rubbed off in the process of filing.

Fillet, a little band to bind the hair. — Any small timber or scantling equal to, or less than, battens. — A strip of card-clothing. — A little rule or ringlet of leaf gold, drawn over certain mouldings, or on the edges of frames, panels, etc.

Fillings, a brewer's term for prepared wort, added in small quantities to casks of ale to cleanse it. — The woof in weaving.

Fillister, a plane used for making the outer part of a window-sash fit for receiving the glass.

Filly, a young mare.

Filoche [Fr.], a large rope used by millers and others.

Filoseda [Sp.], a silk and worsted fabric.

Filoselle, ferret or floss silk; grosgrain yarn.

Filter. See FILTERING.

Filtering-Paper. See FILTRATION.

Filtration, Filtering, the separation of liquids from substances mechanically suspended in them, by passing them through media having pores sufficiently fine to retain or keep back the solid matter. *F.* is one of the most common and useful of the chemico-mechanical operations of the arts, and its successful performance in an economical and expeditious manner is therefore a matter of the highest importance in almost every branch of human skill and industry in which liquids are employed. Simple in principle, and apparently easily performed, it is, nevertheless, one of those operations which require no less of care than of tact and experience to conduct it with certainty and success. The losses sustained in the laboratory, by defective manipulation in this particular, often

exceed those arising from ignorance and accidents in every other department conducted in it. *F.* is generally resorted to for the purpose of freeing liquids from feculence, dirt, and other foreign matter, and for obtaining them in a clear or transparent state; but, in some cases, it has for its object the collection of the suspended substances, as precipitates, etc., and in others both these intentions are combined. The word "filtration" is absolutely synonymous with *straining*, but in the language of the laboratory it is usually applied to the operation of rendering liquids transparent, or nearly so, by passing them through fine media, as filtering-paper, sand, and the like; whilst the term "straining" is employed to designate the mere separation of the grosser portion, by means of coarse media, flannel, horse-hair cloth, etc., through which they flow with considerable rapidity. *F.* is distinguished from *clarification* by its mere mechanical action, whereas the latter operates by depuration, or the subsidence of the suspended substances or fæces, arising from their gravity being naturally greater than the fluid with which they are mixed, or being rendered so by the application of heat, or by the addition of some foreign substance. — The apparatus, vessels, or media employed for filtration are called *filters*, and are technically distinguished from *strainers* by the superior fineness of their pores. Both strainers and filters act on the same principles as the common sieve on powders; they all, in like manner, retain or hold back the coarser matter, and permit the liquid or smaller and more attenuated particles to pass through.

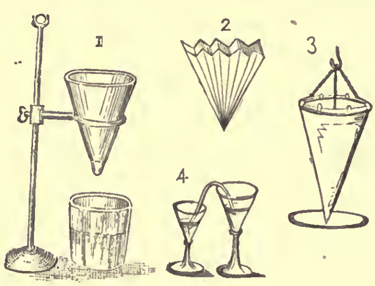


Fig. 176. — FILTERS.

The term *medium* (plural *media*) is applied to the substance or substances through the pores of which the liquid percolates. The form of filters and the substances of which they are composed are various, and depend upon the nature of the liquids for which they are intended. On the small scale, funnels of tin, zinc, copper, wedgewood-ware, earthenware, glass or porcelain (1, Fig. 176), are commonly employed as the containing vessels. The filtering medium may be any substance of a sufficiently spongy or porous nature to allow of the free percolation of the liquid, and whose pores are, at the same time, sufficiently small to render it limpid or transparent. Unsized paper, flannel, linen, calico, cotton-wool, felt, sand, coarsely powdered charcoal, porous stone or earthenware, and numerous other substances of a similar kind are employed for this purpose. For many liquids that filter easily, and in which the suspended matter is of a coarse and porous nature, it is often sufficient merely to place a little cotton-wool or tow, or a small piece of sponge, in the neck of the funnel; but such an apparatus, from the small extent of the filtering surface, acts either slowly or imperfectly, and soon gets choked up. Filters of unsized paper are well suited for all liquids that are not of a corrosive or viscid nature, and are universally employed for filtering small quantities of liquids in the laboratory. A piece of the paper is taken of a size proportionate to the quantity of the liquid to be filtered, and is first doubled from corner to corner into a triangle, which is again doubled into a smaller triangle, and the angular portion of the margin being rounded off with a pair of scissors, it constitutes a paper cone, which is placed on a funnel of proportionate capacity, and is then nearly filled with the liquid. A piece of paper so cut, when laid flat upon the table, should be nearly circular. Filtering paper is sold ready cut in circles of various sizes, which simply require doubling for use. Another method of forming a paper filter, preferred by some persons, is to double the paper once, as above, and then to fold it in a similar way to a fan (2, Fig. 176), observing so to open it and lay it on the funnel that a sufficient interval be left between the two to permit of the free passage of the filtered liquid on its descent towards the receiver. The "plaited filter," as thus formed, is exceedingly useful for general purposes; it exposes the entire surface of the paper to the liquid, and allows filtration to proceed more rapidly than a "plain filter" does. In reference to funnels, it may be remarked that those employed for filtering rapidly should be deeply ribbed on the inside, or small rods of wood or glass, or pieces of straw, or quills, should be placed between them and the paper. The neck or tubular part of the funnel should, in like manner, be deeply ribbed or fluted on the outside, to permit of the free passage of the air, when it is placed in a narrow-mouthed bottle or receiver. When this is not the case, *F.* proceeds but slowly, and the filtered liquid is apt to be driven up the outside of the neck of the funnel by the confined air, and to be continually hissing and flowing over the mouth of the vessel. The breadth of a funnel, to filter well, should be about three fourths its height, reckoning from the throat. When deeper, the paper is liable to be continually ruptured, from the pressure of the superincumbent fluid; and when shallower, *F.* proceeds slowly, and an unnecessarily large surface of the liquid is exposed to the atmosphere, and is lost by evaporation. To lessen this as much as possible, the upper edge of the glass is frequently ground perfectly smooth, and a piece of smooth plate-glass is laid thereon. When paper filters are of large dimensions, or employed for aqueous fluids that rapidly soften the texture of the paper, or for collecting heavy powders, or metallic precipitates, it is usual to support them on linen or calico, to prevent their breaking. This is best done by folding the cloth up with the paper, and cutting the filter out of the two, in the same way as would be done with double paper, observing so to place it in the funnel that the paper and calico may remain close together, especially towards the bottom. The *F.* of small quantities of liquid, as in chemical experiments, may often be conveniently performed by merely placing the paper on the circular top of a recipient, or on a ring of glass or earthenware laid on the top of any suitable vessel. A filter of this kind that will hold one fluid ounce will filter many ounces of some liquids in an hour. — Good filtering-paper should contain no soluble matter, and should not give more than $\frac{1}{250}$ to $\frac{1}{200}$ of its weight of ashes. The soluble matter may be removed by washing it, first, with very dilute hydrochloric acid, and secondly with distilled water. The "Munktell" Swedish filtering-paper is composed

of flax fibres very much crushed and broken, and owes its value to the broken pieces of the fibres filling up the pores, and thus preventing solids from passing through the paper. Rhenish filtering-paper is also made from flax, but, in consequence of the more perfect condition of its fibres, is more porous than Munktell's, and therefore inferior to it for filtering purposes. Another kind of Rhenish paper, also of flax, in which the fibres are much torn, is manufactured, and is said to be a useful article, and to allow the rapid passage of fluids through it. The white filtering-papers of English make have a small quantity of cotton mixed with the flax, and the fibres are much torn and crushed; hence they make serviceable filters. — For filtering a larger quantity of a liquid than can be conveniently managed with a funnel, and also for substances that are either too viscid or too much loaded with feculence to allow them to pass freely through paper, conical bags made of flannel, felt, twilled cotton cloth or Canton flannel, linen or calico, and suspended to iron hooks by rings or tapes (3, Fig. 176), are commonly employed. The first two of the above substances are preferable for saccharine, mucilaginous, and acidulous liquors; the third for oily ones; and the remainder for tinctures, weak alkaline lyes, and similar solutions. These bags have the disadvantage of sucking up a considerable quantity of the fluid poured into them, and are therefore objectionable except for large quantities, or when they are to be continued in actual use as filters for some time. On the large scale, a number of them are usually worked together, and are generally enclosed in cases to prevent evaporation, and to exclude dirt from the filtered liquor that trickles down their sides. These arrangements will be noticed further on. — A simple mode of filtering aqueous fluids, which are not injured by exposure to the air, is to draw them off from one vessel to another, by means of a number of threads of loosely twisted cotton or worsted, arranged in the form of a siphon (4, Fig. 176). The little cotton rope at once performs the operations of decantation and *F*. This method is often convenient for sucking off the water from a small quantity of a precipitate.

F. of Water. River water, shallow well water, and cistern water, extensively used for water-supply, being in general largely polluted, it is a wise safeguard to employ a filtering process, and its use is often quite imperative if the laws of health are to be respected. The constructing of water-filters is a matter in which invention has been largely exercised. All sorts of porous substances have been called into requisition, as may be seen by a glance at the patent records. Thus, to mention some of these, we have various kinds of stone, sand, gravel, powdered glass, clay, porous sulphur, preparations of iron, charcoal (vegetable and animal), cloth, felt, horse-hair, skins, paper, silicate carbon, sponge, wood, cane, capillary threads, and so on. Vegetable charcoal, we may note, was first employed in 1802, animal charcoal in 1818, and solid carbon blocks in 1834. — In passing now to examine some of the approved forms of domestic filters at present in use, it should be borne in mind that while any of these filters will doubtless purify water both mechanically and chemically, more or less, it is only on condition of their being properly attended to, and the filtering material renovated at intervals depending on its nature and the nature and amount of impurity in the water. The term "self-cleansing," applied to some filters, may have a (limited) true sense, but if understood to imply that a filter, let alone, will go on *ad infinitum* giving pure water, it is quite inapplicable; solid impurities *must* accumulate and call for removal. The statement, occasionally made, that a filter is "warranted to remove all impurities" from water is absurd, and hardly deserves notice. Absolutely pure water is a thing almost unknown; careful distillation alone will give an approximation to it. Again, the claim that a filter will remove *all* lime from water is often false; filtration is capable of removing only a small quantity of lime. It must be allowed that sundry points in the process of filtration still remain in some obscurity, and it is matter of regret that the action of some common filtering agents has not been so fully cleared up by scientific experiment as others. Still, enough has been ascertained probably to guide to the construction of a filter on rational principles. — In a large proportion of filters, as already indicated, some form or other of carbon is the chief filtering agent. The well-known filters of Lipscombe are cylindrical-shaped covered vessels of glazed earthenware, in which the filtering medium, a mixture of vegetable and animal charcoal, in granular form, is enclosed between two slabs cemented in the case. The upper (glazed earthenware) slab has a central aperture with raised border, and a small perforated basin immediately below it; into this is inserted a sponge to arrest the grosser impurities, which is taken out and cleaned at short intervals. The filtered water passes through the lower (and porous) slab to the reservoir below, which communicates above with the outer air by a narrow tube passing up within to the top of the apparatus, and delivers its water through a tap. — Charcoal in the form of solid finely porous blocks, which can be conveniently brushed and cleaned externally, is now often moulded for filters. The convenient decanter filter, in which the water passes through the block to a central tube (Fig. 177), forms an elegant addition to the sideboard. Sometimes the block is fitted in a movable pan. Again, in the filter shown in 1, Fig. 178, a double *F.* is effected, the water passing first through loose charcoal, B, then through a charcoal block, C, supported as shown. The block in this case is said to last longer without cleaning. The movable and perforated earthenware plate, A, which is placed above the charcoal (2, Fig. 178), allows of easy renewal of the latter. The charcoal used in these filters is chiefly of vegetable origin. They are found to remove more or less of organic and inorganic matter dissolved in water. — *Fresh* animal charcoal has been proved to act powerfully in the removal of organic impurity (considerably more so than vegetable charcoal), as well as of mineral matter. But its reduction of the hardness ceases in about a fortnight, the removal of organic matter continuing even after six months, though to a much less extent, especially if the filter be much used. — A very powerful filtering medium was discovered and introduced many years ago by Mr. T. Spencer. It is called *magnetic carbide*, and consists of protoxide of iron in chemical combination with carbon. It is obtained by roasting hematite iron-ore with granulated charcoal for twelve to sixteen hours at a dull red heat. Mr. Spencer considers the purifying property of the oxide to be due to its power of attracting oxygen to its surface, without the latter being acted upon, the oxygen attracted being then changed into ozone, by which the organic matter of the water is consumed. The magnetic carbide is used in granular form. This filter gained prize medals at the London and Paris exhibitions, and its efficiency was demonstrated by the *Lancet* Sanitary Commissioners' report on filters in 1867. — The only other system we shall here notice is that in which spongy iron is used. This substance is metallic iron which has been reduced from an oxide without fusion. It is in a spongy or porous state of extremely fine division. Its remarkable purifying action on water was dis-

Fig. 177. — Decanter Filter.

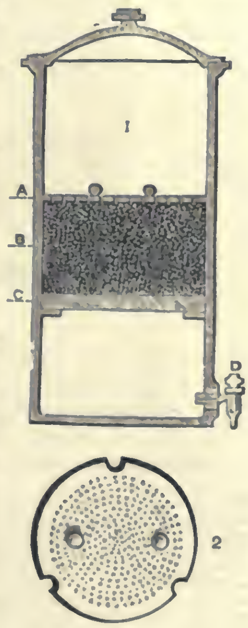


Fig. 178. — Filter with Double Action.

covered by Prof. Gustav Bischof; and experiments made with his filters showed that their power both of removing organic matter and reducing the hardness of water even increased during upwards of eight months' constant use. The general form of the filter is represented in Fig. 179. An inner vessel containing the spongy iron is supported in a case, which, below, contains some prepared sand, a regulator, A, and a receptacle, C, for filtered water (with tap, not shown). The unfiltered water, B, is in this form supplied from a bottle which is inverted into the upper part of the inner vessel (a method familiar to chemists). After passing through the spongy iron, the water ascends

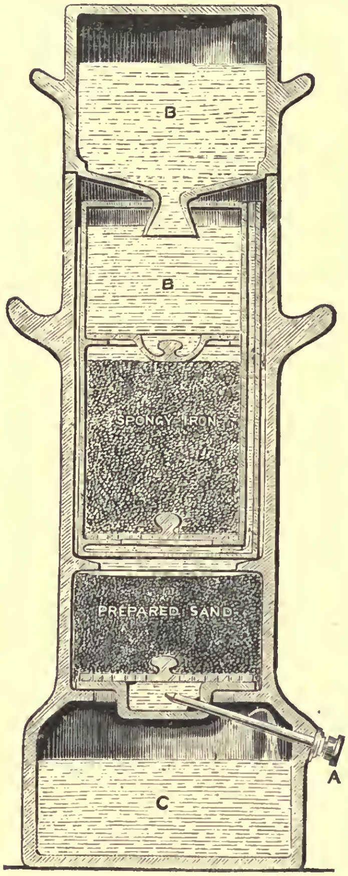


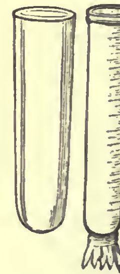
Fig. 179. — Bishop's Spongy Iron Filter.

A, regulator; B, unfiltered water; C, filtered water.

through an overflow-pipe in the direction of the arrows; the object of this is to keep the spongy iron, when once wet, constantly under water, as otherwise it is too rapidly oxidized. The object of the prepared sand (which is generally in three layers, viz., pyrolusite at the top, then sand, then gravel) is to separate traces of iron retained in solution. The regulator, A, consists of a tin tube, cemented in the position shown; it is open at the inner end, which is below the perforated bottom supporting the sand, and closed by a screw-cap at its outer end. It has also a small lateral perforation, through which alone the filtered water passes into the reservoir. Should the perforations get choked, the screw-cap is removed, and a brush inserted; on starting at first, too, the cap is unscrewed, that the materials may be well washed out without soiling the lower reservoir. With a ball-cock and constant supply of water, the inner vessel is dispensed with. The nature of the action of the metal on organic matter is rather obscure. Mr. Bischof considers there are both reducing and oxidizing agencies constantly at work, and that the oxides of iron, being present in their nascent state, must be very energetic in their action. Probably ferric hydrate, the last product of oxidation, takes an active part in separation of the organic matter, transferring oxygen to it. Again, spongy iron is known to be very energetic in precipitating any lead or copper. Its reduction of the hardness of water presents some difficulty. This filter, we may add, recently gained the prize medal for general excellence given by the Sanitary Institute of Great Britain.

F. of Oils. Oils are filtered on the small scale, through cotton-wool, or unsized paper, arranged in a funnel; and on the large scale, through long bags, made of twilled cotton cloth (Canton cloth). These bags are usually made about 12 or 15 inches in diameter, and from 4 to 8 feet long (Fig. 180), and are enclosed in bottomless casings, or bags of coarse canvas, about 5 to 6 or 8 inches in diameter, for the purpose of condensing a great extent of filtering surface into the smallest possible space. A number of these double bags are connected with corresponding holes in the bottom of a block-tin or tinned-copper cistern, into which the oil to be filtered is poured. The mode in which these bags are fastened to the cistern is of the utmost importance, as on the joint being close and secure depends the integrity of the apparatus. The bags are surrounded by a wooden screen fitted up with doors for the purpose of keeping off the dust; and the bottom of the apartment is furnished with large steam-pipes, by which a proper temperature may be kept up in cold weather. The use of heat should, however, never be had recourse to when it can be avoided, as, although it vastly increases the rate of *F.*, the oil so filtered is more apt to become opaque in cold weather than when the process is conducted at the natural temperature of the atmosphere. This is particularly the case with castor oil and sperm oil. In practice, it is more convenient to have a number of small cisterns at work (say 50 or 100 galls. each), than one or two larger ones, as any accident that may occur is more easily remedied, and that without stopping the whole operation. When cotton-cloth bags are employed without being "creased," or enclosed in others of canvas, they should not be longer than about 3 or 4 feet, and not wider than about 5 or 6 inches when filled. When larger they are dangerous. — A convenient method of filtering a single cask of oil is, to insert the pipe of a two-way patent filter into the cork-hole (1, Fig 181), by which means the whole will be filtered as drawn off, without any trouble on the part of the operator. This filter consists of a porous bag stretched over a perforated metallic vessel, nearly the shape and size of the exterior casing, and its edge is tightly screwed between the sides and bottom of the latter, so as to be quite water-tight. The cock communicates with the interior of the perforated plate and filter, and the supply-pipe with the exterior. By this means the interior chamber, which occupies $\frac{3}{4}$ of the vessel, rapidly fills with filtered oil, and continues full as long as any liquor remains in the cask. This arrangement is also well adapted to the filtration of wines, beer, cordials, porter, and various other liquors. It is unequalled in simplicity and usefulness. The same filter may be removed from cask to cask, with the facility of a common cock.

Cotton filtering-bag, "*creased*," or enclosed in its canvas envelope, ready for fixing.



Filtering-bag of cotton cloth.

Fig. 180. — Oil Filtering-Bags.

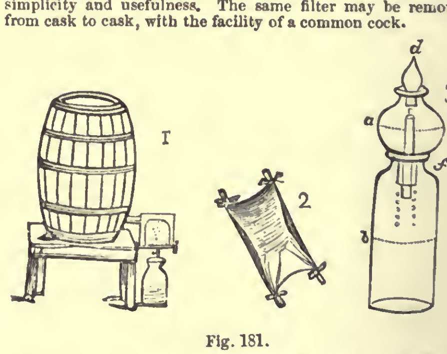


Fig. 181.

F. of Sirups is now generally effected on the large scale by passing them through the *creased-bag filter* just described. On the small scale, as employed by confectioners and druggists, they are usually passed through *conical flannel bags* (3, Fig. 176). The *F.* of thick sirups is, however, attended with some difficulty, and it is therefore a good plan to filter them in a somewhat dilute state, and afterwards to reduce them to a proper consistence by evaporation in clean vessels of tinned copper, by steam heat. Sirups, when filtered in a heated state, run well for a time, but the pores of the fabric rapidly get choked, from the thickening of the sirup and partial crystallization of the sugar, occasioned by the evaporation of the aqueous portion from the surface of the bag. This may be partially prevented by enclosing the bag in a metallic casing. On the whole, clarification is preferable for sirups to filtration on the small scale.

They need only be well beaten up while cold with a little white of egg, and then heated; a scum rises, which must be removed as soon as it becomes consistent, and the skimming continued until the liquid becomes clear. Any floating portions of scum that may have escaped notice are easily removed by running the sirup through a coarse flannel strainer whilst hot. The most extensive application of the process of *F.* in the arts is in the refining of sugars.

F. of Tinctures and Vegetable Juices. They are usually filtered, on the small scale, through *bibulous* or *unsized paper* placed on a funnel; and on the large scale through thin and fine *cotton bags*. In general, however, tinctures clarify themselves by the subsidence of the suspended matter, when allowed to repose for a few days. Hence it is the bottoms alone that require filtering, the supernatant clear portion need only be run through a small hair sieve, or some other coarse medium, to remove any floating substances, as pieces of straw, etc. When possible, tinctures, spirits, and all similar volatile fluids are better and more economically cleared by subsidence or clarification than by *F.*, as, in the latter way, a portion is lost by evaporation, and the strength of the liquid is thereby altered. — Vegetable juices should be allowed to deposit their feculous portion before *F.* The supernatant liquid will then be often found quite clear. It is only when this is not the case that *F.* should be had recourse to. A small quantity may be filtered through coarse or woollen filtering paper, supported on a piece of coarse calico placed on a funnel; when the quantity is large, one of the *conical bags* before described should be employed. The bottoms from which the clear portion has been decanted should be placed on a separate filter, or else not added until the whole of the other portion has drained through. Vegetable juices are often rendered clear by simply heating them to about 180° or 200° F., by which their albumen is coagulated; they are also frequently clarified by the addition of a little white of egg and heat, in the same way as sirups. A convenient method of straining vegetable infusions and decoctions is, to stretch a square of flannel on a frame or "horse," securing it at the corners by pieces of string (2, Fig. 181). Such a frame, laid across the mouth of a pan, is more easily fed with fresh liquid than a bag, whose mouth is 40 or 50 inches higher. Many vegetable solutions, that from the viscidity of the suspended matter can scarcely be filtered, may be readily clarified with white of egg in the cold, or pass the filter rapidly if a very small quantity of acetic, tartaric, sulphuric, or other strong acid is previously added.

F. of Corrosive Liquids, as the strong acids, are filtered through powdered glass, or *siliceous sand*, supported on pebbles in the throat of a glass funnel, or through asbestos or gun-cotton placed in the same manner. Charcoal has also been employed for the same purpose, but is not fit for some acids. Strong caustic alkaline lyes are also filtered through powdered glass or sand. Weak alkaline lyes may be filtered through fine calico, stretched across the mouth of a funnel. Many corrosive liquids, as solution of potassa, etc., require to be excluded from the air during *F.* The simplest apparatus that can be employed for this purpose is seen in 3, Fig. 181: *a* is a globular bottle fitted with the ground stopper, *d*, and having a perforated neck, *f*, ground to the bottle, *b*; *c* is a small tube, wrapped round with as much asbestos, linen, or calico as is required to make it fit the under neck of the bottle through which it passes. For use, the solution to be filtered is poured into the bottle, *a*, nearly as high as the top of the tube, *c*, and the stopper is replaced. The liquid then descends into *b*, and a similar quantity of air passes up the tube into *a*.

When a precipitate, or the suspended matter in a liquid, is the object of the *F.*, the filter should be of such a nature that the powder may be easily separated from it when dry, and that with the least loss possible. Linen filters are for this reason preferable for large quantities, and those of smooth bibulous paper for small ones. The powder should be washed down the sides of the filter, and collected, by means of a small stream of water, in one spot at the bottom, assisting the operation with a camel-hair pencil, and, when the whole is dry, it should be swept off the paper or cloth with a similar pencil or brush, and not removed by a knife, as is commonly done, when it can be possibly avoided. — The "first runnings" of liquid from a filter are commonly foul, and are pumped back, or returned until the fluid runs perfectly limpid and transparent, when it is "turned into" the "filtered liquor cistern," or proper receiver. In many cases the liquid does not readily become transparent by simply passing through the filter; hence has arisen the use of *filtering-powders*, or substances which rapidly choke up the pores of the media in a sufficient degree to make the fluid pass clear. In the employment of these powders care should be taken that they are not in too fine a state of division, nor used in larger quantities than are absolutely necessary, as they are apt to choke up the filter, and to absorb a large quantity of the liquid. The less filtering powder used, the more rapid will be the progress of the *F.*, and the longer will be the period during which the apparatus will continue. For some liquids these substances are employed for the double purpose of decoloring, or whitening, as well as rendering them transparent. In such cases it is preferable, first, to pass the fluid through a layer of the substance in coarse powder, from which it will "run" but slightly contaminated into the filter; or, if the powder is mixed with the whole body of the liquid, as in bleaching almond-oil, etc., to pass the mixture through some coarser medium to remove the cruder portion before allowing it to run into the filter. Another plan is, after long agitation and subsequent repose, to decant the clearer portion from the grosser sediment, and to employ separate filters for the two. Granulated animal charcoal is used according to the first method to decolor sirups, oils, etc.; and filtering-powder by the second and third, to remove a portion of the color, and to clarify castor and other oils. The common plan of mixing large quantities of filtering-powder with castor oil, and throwing the whole into the filter, as adopted by the druggists, is injudicious. When simple *F.* is required, it is better to use little or no powder, and to continue returning the oil that "runs" through, until, by the swelling of the fibres of the filter bags, it flows quite clear. By this plan the same filters may be used for a long period of time (for many years), and will continue to work well, whilst, by the usual method, they rapidly decline in power, and soon deliver their contents slowly, and after a short time scarcely at all. — It is often of great advantage to render a filter "self-acting," or to construct it in such a way that it may "feed itself," so that it may continue full and at work without the constant attention of the operator. On the small scale, this may be readily effected on the principle of the common fountain lamp (1, Fig. 182); and on the large scale, by placing the vessel containing the unfiltered liquid on a higher level than the filter, and by having the end of the supply pipe fitted with a ball-cock, to keep the liquid in the filter constantly at the same height. — The rapidity of *F.* depends upon the porosity of the filtering medium, the extent of the filtering surface, the relative viscidity or mobility of the filtering liquid, the pressure or force by which the liquid is impelled through the pores of the filter, and the porosity and fineness of the substances it holds in suspension. The most efficient filter is produced when the first two or the first three are so graduated to the others that liquid filters rapidly, and is at the same time rendered perfectly transparent. — In the common method of *F.*, no pressure is exerted beyond that of the weight of the column of the liquid resting on the filtering medium, but in some cases additional pressure is employed. This is had recourse to for the purpose of producing a more rapid *F.*, and more especially for filtering liquids that, from their viscidity, will scarcely pass through the pores of substances sufficiently fine to remove their impurities in the ordinary way. One of the easiest means of employing pressure in *F.* is to increase the height of the column of the filtering liquid. From the peculiar properties of fluids, by which they transmit pressure in an equal degree in all directions, the vessels need not be of equal diameter throughout, but may be conveniently contracted to the size of a small pipe, as in 2, Fig. 182, which represents a small filter on this construction at work. *a* is the funnel or reservoir of foul liquid; *b*,

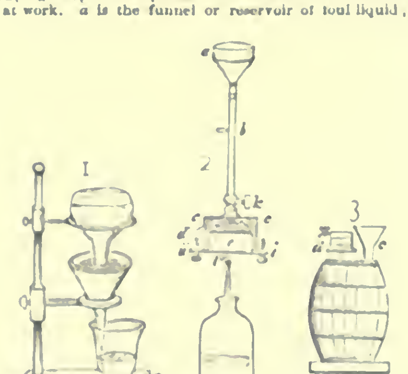


Fig. 182.

a small pipe conveying the liquid to the filter; *c c*, a chamber, of which the upper portion, *d*, is filled with the descending liquid, and the lower portion, *e*, with the filtering media; *i i* are screws by which the bottom plate is fastened on, which plate is removed to clean out or renew the filter. For use, the cocks *k* and *l* are closed, and the liquid poured into the funnel, *a*; the cock *k* is next opened, and, in a few minutes after, the cock *l*, when an uninterrupted flow of filtered liquor will be obtained as long as any fluid remains in the funnel, *a*, and the tube, *b*. The length of the tube determines the degree of pressure. Care must be taken first to pass the foul liquid through a hair sieve, or some other strainer, to remove any substance that might choke up the pipe *b*. — Another method of employing pressure in *F.* is the withdrawal of the air from the receiving vessel, as in the vacuum filter, by which

a pressure of about 14½ lbs. to the square inch becomes exerted on the surface of the liquid by the atmosphere. The vacuum in the receiving vessel may be produced by the air-pump, by steam, or by the Bunsen or Sprengel pump. — A commoner method of applying pressure than either of those already mentioned is to condense the air over the surface of the liquid by means of a forcing-pump, or by steam. — On the small scale, pressure may be applied to *F.* by means of a siphon, whose shorter leg has its mouth blown into the shape of a bell or funnel, over which filtering paper or fine calico may be stretched. — The application of pressure to *F.* is not always advantageous, and beyond a certain limit is generally attended with inconvenience, if not with absolute disadvantage. It is found in practice that fluids under pressure take a longer period to run clear than without pressure, and that ruptures of the media more frequently take place in the former case, or with pressure, than in the latter. Great pressure is in no case advantageous.

The filters already noticed are those that act by the fluid descending through the media; but in some cases the reverse method is employed, and the liquid filters upwards, instead of downwards. These are called ascending filters, and are often preferable to those on the descending principle, because the suspended matters that require removal by filtration usually sink, and thus a portion escapes being forced into the pores of the filter. They are also more convenient when pressure is employed. The construction depends upon the same principles as the common filter, and merely requires that the feeding vessel should be higher than the upper surface of the filtering media *Oils* are conveniently filtered in this way, because of their little specific gravity. By fixing (3, Fig. 182) a small filter, *d*, on this principle into the head of a cask, and pouring in water through a funnel, *c*, whose neck reaches nearly to the bottom of the cask, the oil will float up and pass the filter, leaving the sediment behind. In cold weather hot water may be employed. — In some cases the upward and downward systems of filtration are united in the same apparatus, and this plan is advantageous where the space for operating is limited. For this purpose it is merely necessary to connect the bottom of an ascending filter with the top of a descending one, or the reverse; the proper pressure being in either case applied.

Fimble, a light kind of hemp.

Fin, a membraneous wing-like appendage to fish. — A trade name for a blade of whalebone. — A mark or ridge left in casting at the junction of the parts of the mole. — A tongue on the edge of a board.

Finance. In the 13th and 14th centuries the words *finare*, *financio*, and *financia* were employed, principally by writers in France, to denote those bargains by which the indefinite liabilities of ancient tenures were commuted by fixed sums payable to the immediate lord of the tenant. In course of time the word "finance" became nearly synonymous with the product of taxation, and the finances of a country are understood to be the ways and means by which the expenditure of a government are met. The word is also commonly applied to the art of managing money-matters, the person who professes this art being called a *financier*. See MONEY, NATIONAL DEBT, etc.

Findings, the wax, thread, and tools which a journeyman shoemaker has to supply himself with in his work.

Finding-Store, a store where shoemakers' tools, trimmings, etc. are vended, and which, in England, is termed grindery-warehouse.

Fine-Arts, a term applied to painting, sculpture, architecture, and other arts requiring taste, skill, and judgment in the execution, and in which the artist seeks chiefly to give pleasure by the immediate impression produced on the mind by his work; these arts being thus distinguished from arts which are designed to answer some practical purpose, and so have been termed *useful*.

Fine-Drawing, a finishing process with cloth, in which it is subject to a strong light while all faulty parts or breaks in the fabric are closed by sound yarn introduced by a needle. — *E. H. Knight.*

Fineness, the proportion of pure metal in an alloy, expressed in 1,000 parts; as the *F.* of U. States gold coin is 900, the other 100 being alloy. See ASSAY.

Fineer [Scotch], to veneer.

Finery, showy articles of dress; jewels, trinkets, etc. — The furnace in which cast-iron is converted into malleable iron.

Finesse [Fr.] may be defined simply as a peculiar aptitude of discovering in any business the best means of attaining the object in view; or as the power of embracing in one comprehensive glance the various interests of any subject, together with ingenuity to devise and tact to carry out the plan best calculated to obtain success.

Fine-Stilling, the distillation of spirit from molasses or other preparations of sugar.

Fine-Stuff, the second coat of plaster for the walls of a room, composed of finely sifted lime and sand mixed with hair; the first coat is of a coarser material.

Finger, an ancient measure, the fourth part of the palm, or hand, nearly an inch. — A measure of domestic use in the U. States, of about 4½ inches, or ⅛ of a yard.

Finger-Board, the neck of a violin, banjo, guitar, etc., on which the strings are pressed by the fingers in playing.

Finger-Glass, a colored or plain glass vessel to hold water for rinsing the fingers after dessert.

Fingerin, worsted spun in Scotland, from combed wool, on a small wheel.

Finger-Plate, an ornamental piece of metal or porcelain fixed on the edge of a door, to keep off finger-marks from the paint-work.

Fingroms, woollen cloth made of combed wool.

Fining, the process of refining, purifying, or clarifying turbid liquors. The simplest mode of *F.* is by passing the liquor through a porous substance that retains the solids and allows the clear liquid to pass through (see FILTER); but this method is only applicable to particles mechanically suspended in a limpid liquid. When the liquid contains mucilaginous or other matter, that readily clogs the filter, some other means of *F.* must be used. Such is the case with all malt liquors, and most wines when turbid. When in good condition, these do not usually require *F.*, as the suspended matter agglomerates, and sinks to the bottom shortly after the fermentation is completed. When this does not take place, some means of promoting such action are usually adopted. One of the simplest is to add soluble albumen, such as white of egg, to a portion of the liquid, and, after beating it well in this, to add the mixture, and stir it into the whole of the liquid. Upon the application of heat, the albumen coagulates and contracts from its diffusion into a scum, enveloping and drawing together the suspended matter. The scum is then easily removed. This method is adopted for sirups and other liquids that may be heated without mischief. In making clear soups, the albumen of the meat performs this function. As alcohol coagulates albumen, it may be used for *F.* wines and cordials without the application of heat. It is generally used for red wines. Malt liquors are usually fined by means of gelatine, either isinglass or cheaper substitutes being used. One pound of isinglass is soaked in three or four pints of water, or sour beer, then more sour liquor added as the isinglass swells, until it amounts to about a gallon. The jelly thus formed is next dissolved in seven or eight gallons of the liquor to be fined. This solution, having the consistence of a sirup, is called *brewers' finings*, and about a pint to a pint and a

half is added to a barrel of ale or porter, or to a hogshead of cider or wine. The action of this depends upon the combination of the gelatine with the astringent matter (*tannic acid*) of the liquor, forming thereby an insoluble solid, which sinks to the bottom, and carries with it, like the coagulating albumen, the suspended matter; but as the flavor of malt liquors partly depends upon the astringents they contain, the *F.* affects the flavor; the astringents also help to preserve the liquor, and hence their removal is in this respect disadvantageous. Malt liquors thus fined do not "stand well on draught." The use of gelatine for *F.* red wines is objectionable, as in most of these the astringent flavor is an esteemed quality, and therefore albumen is preferred. — There are other methods of *F.*, but all of them are more or less objectionable. Liquors that are unusually difficult to fine are called *stubborn* by coopers and cellarmen.

Fining-Pot, a vessel in which metals are refined.

Finish, the peculiar style and effect produced on the surface by the last touches.

Finisher, one who completes work for sale, as in watch-making, the boot and shoe trade, etc.

Fir. See PINE.

Fire, the effect of combustion; also a burning, a conflagration. See COMBUSTION, HEAT, LIGHT, INSURANCE (FIRE), etc.

Insurance. — (What is fire?) The necessity for defining exactly what is loss by fire within the meaning of the word in insurance policies has frequently arisen. It is clear that damage may arise as a consequence of fire which is not precisely and directly a damage by fire. Thus, for instance, lightning is fire, and is capable of burning, but it frequently destroys or injures by the force of the electric current, as when stone or brick work is dislodged on being "struck," as it is termed. Again, great destruction is often caused by the explosion of gas, without any combustion of the destroyed materials. As a concession and act of grace all the offices now admit claims from gas explosions, but not from explosions generally. The simple rule for determining the question of what is fire within the meaning of a fire policy, is to decide whether there has been *actual ignition* of what is insured. Difficult cases may, and do occasionally arise, but as a general rule the definition of damage by fire as damage by actual ignition will be decisive.

Fire-Alarm Telegraph, a system of telegraphy of American invention, patented in 1857 by Farmer and Channing, and used in all the large cities of the U. States for giving notice of fire. It comprises a series of signal-boxes at suitable intervals over the city, connected by telegraph wire, with the central office and all the stations of the fire department. They are small boxes about a foot square, numbered in order and placed conspicuously on telegraph poles, or on the side of a building at corners of streets. Inside of each is a simple clock-work, which is set in motion by the pulling of a handle, and which records at the central office the number of the box.

Fire Annihilator, invented by Phillips in 1849. This is essentially a gaseous fire-engine, which at any moment can be made to discharge a stream of mixed gases and vapors having the power of checking combustion. When first introduced it was generally regarded as a most important invention, but it has not proved an effective substitute for the common water-engine. For extinguishing fires on board ship and in close apartments it is undoubtedly well adapted, but as a street-engine it is comparatively useless, owing to the unmanageable nature of its fire-annihilating vapors. The composition with which the apparatus is charged is a mixture of dried ferrocyanide of potassium, sugar, and chlorate of potassa. It is set in action by a blow on a glass vessel containing oil of vitriol, which, being fractured, permits the acid to flow over the "charge," when the anti-combustion gas is liberated, and rushes forth with great impetuosity. See FIRE-EXTINGUISHER.

Fire-Arms, a general name for all kinds of arms or offensive weapons from which destructive missiles are discharged. See CANNON, GUN, REVOLVER, etc.

Fire Association of Philadelphia, a fire-insurance Co., located in Philadelphia, Pa., and organized in 1820. *Statement*, Jan. 1879: Cap. stock paid up in cash, \$500,000; net surplus, \$422,326.19; risks in force, \$169,070,653; premiums, \$2,729,887.86; premiums received since the organization of the Co., \$8,826,025; losses paid, \$3,615,199.95; cash dividends paid to stockholders, \$1,579,762.

Fire-Ball, a grenade filled with combustibles, to be thrown among enemies for the purpose of setting fire to, or merely illuminating, some work against which hostile operations are directed.

Fire-Balloon, a balloon sent up at night with fireworks, which ignite at a regulated height.

Fire-Bars, wedge-shaped iron bars fitted to the fire-box of a locomotive boiler with the thick side uppermost, to support the fire; the ends rest on a frame; they are inclined inward, with an air-space between each, to promote combustion, and are joined at one end, and supported by a rod at the other, so that, the rod being withdrawn, the bars fall and the fire-box is emptied.

Fire-Basket, an iron receptacle for holding a small portable grate with coals, etc., for a bedroom.

Fire-Box, the box (usually made of copper) into which the fire of a locomotive boiler is placed. The outside is of iron, separated from the copper fire-box by a space of about 3 inches all around for water. — *Fire-box door*, the door opening into the fire-box, facing the locomotive tender, by which coke is supplied to the fire — *Fire-box partition.* In large fire-boxes a division is made in the box, into which the water is admitted; this division is about the height of the fire-box door, and divides the fire into two parts in a locomotive-engine, thereby increasing the heating surface of the fire-box. — *Fire-box stays*, deep, strong iron stays bolted to the top of the copper fire-box, to enable it to resist the pressure of the steam; round copper or iron stays are also used to connect the outside shell to the inside box, in the proportion of about one stay to every 4 square inches of flat surface.

Fire-Brick. See BRICK.

Fire-Brush, a hair sweeping-brush for the hearth of a room.

Fire-Bucket, a light canvas or leather pail, chiefly used on shipboard, to carry water for putting out fires.

Fire-Clay Bricks and Retorts. Fire-clays, used in the manufacture of fire-bricks, may be defined as a native combination of hydrated silicates of alumina mechanically associated with silica and alumina in various states of subdivision, and sufficiently free from silicates of the alkalies and from iron and lime to resist vitrification. The best fire clays are characterized by a preponderance of alumina, tenacity of texture,

contractibility in the kiln, and an absence of iron and the alkalies, etc., which tend to vitrification. Tenacity of texture in a fire-brick material is a mechanical condition which assists vitrification, a coarse open body being more refractory than a coarse homogeneous brick of similar chemical composition. A well-manufactured brick should be of a pale cream or buff color, uniform throughout its mass, and burnt to the full extent of its contractility. A properly burnt brick, uniform in color throughout its mass, can only be obtained by slow, progressive firing; a broken brick that has been too quickly burnt, though pale on the surface, presents a darker central patch, and concentric rings of various shades of color, due mainly to the different states of oxidation of the iron, and partly to the presence of unconsumed carbonaceous matter; but the chemistry of this color-variegation is not clearly understood.

It is beyond the scope of this article to enter into the details of the fire-brick manufacture, which in its main features resembles the manufacture of building-bricks, except that fire-bricks are rarely if ever burnt in clamps. Fire-bricks are now manufactured to perfection in this country. In the large establishment founded in New York by Mr. Adam Weber, under the name of "Manhattan Works," and which may be given as a model of the kind, properly constructed ovens on the "down draught" principle are employed, which insure greater regularity in the burning than in the old form of kiln; and the partially moist ground clay dust is compressed into bricks in iron moulds by steam-power, by which process more shapely bricks are produced than by plastic moulding, and their perfectly true flat sides enables a minimum of jointing material to be employed, a circumstance of importance in the stability of fire-brick masonry, as thick fire-clay jointing contracts in the firing, tending to shatter the structure. In addition to the fire-bricks, blocks, and tiles, for furnaces, rolling-mills, foundries, lime-kilns, glass-works, etc., Mr. Adam Weber manufactures on a large scale the celebrated enamelled clay retorts for gas-works, which, bearing a higher heat than those of iron, are becoming generally adopted. See RETORT.

Fire-Chamber, the chamber at the end of the puddling furnace, whence the flame passes to the reverberating chamber where the charge is placed.

Fire-Cock, a plug for obtaining water from the main pipes in a street to extinguish fires.

Fire-Cracker, a kind of small Chinese firework, containing gunpowder tightly confined in thick rolls of clay and paper, exploding with a loud, sharp noise, and largely used throughout the U. States on Independence Day, the imports from China for the year 1878 amounting to $145,054. This public nuisance has been of late prohibited — ineffectually to this day — by the legislature of New York and other States.

Imp. duty, per box of 40 packs, not over 80 in each pack, $1 per box; and in the same proportion for greater or less numbers.

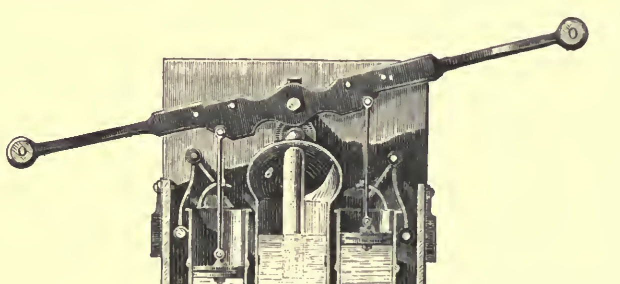


Fig. 184. — HAND-WORKED FIRE-ENGINE.

Fire-Damp. In most coal-mines the coal itself is subject to chemical changes which cause it to give forth large quantities of carburetted hydrogen gas, known to the miners as *F.-D.* Sometimes, when a hole for blasting is bored, a jet of this terrible gas will immediately stream forth from it. There are many cavities in the coal quite full of gas; and when one of these is laid open by the miner's pick, the gas rushes out with a current called a *blower*, continuing in action for even months together. Long pent-up reservoirs of such gas, set free after an unknown period of accumulation, are the most dangerous sources of explosion. If small coal is set on fire by the explosion, there is still a further danger from *choke-damp*, or suffocating carbonic acid. When sad experience showed how dangerous an open candle is in a coal-mine filled with *F.-D.* or explosive gases, ingenious men sought for some means of averting the danger. At one time a sort of continuous flint-and-steel apparatus was adopted, to keep up a succession of sparks that would in some degree light up the mine; but this has been superseded by the beautiful *safety-lamp* (Fig. 183). The invention was chiefly due to Sir Humphry Davy; but the practical development to George Stephenson and Dr. Clanny, followed by many other ingenious men. The principle of action is, that the inflammable gas of a coal-mine, when kindled into a flame, will not pass through the meshes of a very fine iron wire-gauze; the gas itself will pass when cold or non-ignited, but not as a heated flame. An oil-lamp is placed within a gauze cylinder, having no openings except the meshes. Air easily enters to feed the flame. *F.-D.* also easily enters, kindles, and fills the whole interior of the cage or cylinder with a blue flame; but this flame cannot get out to kindle the great body of gas in the mine. The blue flame in the lamp is a warning to the miner that the air around him is very foul and dangerous. Any defect in the lamp, or any carelessness in his mode of using it, may lead to instant explosion, followed by death or terrible mutilation. The light is sometimes so dim as to tempt the miner to obtain an increase by opening the gauze door of the lamp, — a perilous practice, to avert which numerous forms of new lamps have been invented by Waring, Robinson, Ogden, Muessler, and other inventors.

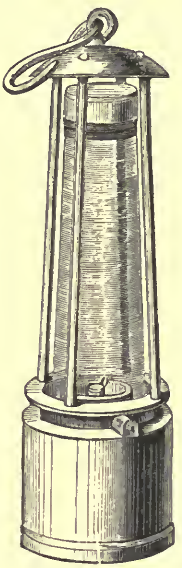


Fig. 183. — DAVY'S SAFETY-LAMP.

Fire-Engine, an hydraulic machine or force-pump, for raising water to a great height to extinguish conflagrations. The *hand-worked engine*, which is still to a great extent in use in England, France, and other European countries, consists essentially (Fig. 184) of a pair of vertical single-acting

force-pumps, worked by means of long brakes, that enable many men to assist in using them. The pumps discharge into one common reservoir, the upper part of which, *e*, contains air, that by its elasticity causes the water to flow in a uniform stream through the discharge-pipe. From this pipe the water is conducted any desired distance through the leathern hose, and discharged through a strong tapering metallic pipe, that is held in the hand to direct the stream upon the fire. A suction-pipe is attached to the lower end of the pump when necessary, but it is not required when the stream of water introduced to supply the pumps has sufficient head. The whole machine is placed upon a carriage expressly constructed for it, and furnished with such implements as are likely to be wanted at a fire. In working the *F.-E.*, ropes are sometimes made fast to the brakes, and, passing through blocks at the bottom of the carriage, are hauled upon by a number of men with each down stroke. Some engines have the pumps arranged horizontally, and men sit on the top and work as in rowing a boat. It is considered a good performance for a first-class hand engine to throw a stream through 100 feet of hose to a height of 100 feet. The *steam F. E.* (Fig. 185) which is now in use in almost all cities of the U. States is essentially a pair of single-acting suction and force pumps driven by steam power. It is hauled by two horses, and is self propelled. The first attempt to apply steam to the working of *F.-E.* was made by Capt. Ericsson, in London, in 1830. After the great fire in New York, in 1835, premiums were offered for plans of steam *F.E.*, and in 1841 one was built from plans of Mr. Hodges, and brought into service at fires with good effect. The great difficulties in the way of the successful use of these first engines was their great weight, and the length of time required for raising steam. The city of Cincinnati first demonstrated the practicability of this application of steam, so as to completely supersede the hand engines in the great cities. The first of these engines was built by the brothers Latta and Mr. Abel Shawk, in 1853. This machine was very large and powerful, — but very heavy, — weighing upwards of 12 tons, and requiring 4 horses to haul it. This machine, with some few others, was constructed so as to apply the steam to the wheels to aid in propelling it through the streets; but this idea was soon abandoned. The controlling feature of the Cincinnati engine is the boiler. It has a square fire-box open at the top, and the upper portion of the furnace is occupied by a continuous coil of water-tubes, opening above into the steam-chamber, and the lower end connected with a force-pump outside, by means of which water is driven through the whole length of the coil. By this arrangement the steam can be raised and the engine be in working order in from 3 to 4 minutes. The Cincinnati engine has been excelled nowhere, and has been copied into the principal cities of the world. As successively improved, it gives the following average record: Time of raising steam, three minutes and forty seconds from the time the torch is applied until water is thrown from the nozzle; size of nozzle, 1¼ inches; distance thrown, 310 feet, measuring from the end of the nozzle to the place where solid water fell; size of steam cylinder, 10 inches bore, 24 inches stroke; pumps, 6 inches bore, 24 inches stroke; double engine cranks at right angles; large air vessels, connected together; length of hose, 100 feet; steam, 100 pounds to the square inch; pressure on water cylinder, 240 pounds to

Fig 185. — Steam Fire-Engine.

the square inch; speed of engine, 110 revolutions; 220 strokes of pumps; grate surface, 16 feet; heating surface, 560 feet. — Steam *F.-E.* are principally manufactured in Philadelphia, Boston, Cincinnati, and Manchester (New Hampshire).

Chemical F.-E., acting on the principle of the *Fire-Extinguisher* (q. v.), have been lately introduced, and are of several forms and sizes, among which Fig. 187 represents the Babcock engine. The size most used consists essentially of two cylindrical copper or steel tanks, each holding 80 gallons of water. The charge for each tank is 28 lbs. bicarbonate of soda and 14 lbs. sulphuric acid. The soda is dissolved in the water, and the acid is held in a leaden jar within the tank, which is securely closed. At the moment of using the sulphuric acid is mixed with the water, and instantly combining with the soda, causes carbonic acid to be given off with a pressure of 140 lbs. on the sq. inch. The tanks are used independently and charged separately, so that a continuous stream of water, usually ½ inch jet, may be maintained. The whole apparatus, charged, and carrying four men, weighs about 3,600 lbs., and is drawn by two horses. The hose is rarely carried upon the engine; it is usually on a separate carriage drawn by one horse. Chemical engines, it is said, can be used with advantage and effect wherever there is a scarcity of water; and still more, where there is an abundance of water, by putting out a fire before the steamers can get to work, and before it becomes large and destructive.

Fire-Escape, a contrivance to facilitate exit from a burning building. The apparatus suggested, and more or less put into operation, to assist in the escape of persons from burning houses, has been exceedingly varied. Straps or belts, sustaining a seat on which the person may be lowered; telescope ladders, capable of being drawn out and pushed in; jointed ladders, connected like the pieces of the chimney-sweeping apparatus; rope-ladders, that may either be lowered from above or raised from below; a pole, with cleats or ledges that will convert it into a kind of ladder; a chair, so placed as to be lowered by ropes from a window; a pole supporting a pulley, by which a rope can be hauled up and down a bag, large enough to contain a man, and arranged so as to be lowered down a ladder; the lazy-tongs (Fig. 186); a canvas shoot, extending from the top to the bottom of a ladder, down which a person might slide, — these are types of the several kinds of fire-escape which have been practically tried.

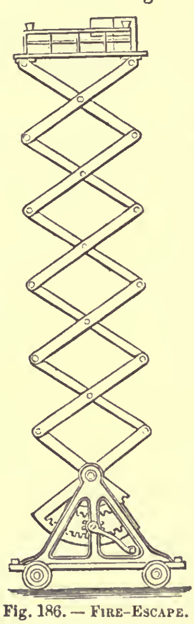


Fig. 186. — Fire-Escape.

Fire-Extinguisher. The portable chemical extinguisher, now in extensive use in factories, warehouses, and public buildings, is chiefly effective to put out any fire in its earliest stages. There are about 60 American patents for various forms of this apparatus, most of which are contrived on this principle, that fire being supported by oxygen, carbonic acid gas, which is much heavier than air, must shut off the supply of oxygen, and immediately smother fire.

In the extinguisher represented in Fig 187, the glass bottle, A, holds a charge of sulphuric acid, and is kept in its position by the cup B and the cap C. The exit pipe extends, inside, to the bottom of the machine. To prepare the extinguisher for use, the extinguisher is filled to within 3 inches of the top with water in which bicarbonate of soda has been dissolved. The bottle of acid, with the cap over the neck, is placed into the cup, and the head being inserted in the extinguisher is screwed down hard and tight. The machine is then charged, and may remain in this condition for any length of time, always ready for immediate use. In case of fire, the handle on top is to be screwed down until the shoulders meet, thus breaking the bottle, and discharging the acid into the carbonated water. Instantaneous chemical action takes place, and the compressibility of the carbonic acid generated affords the power which projects the liquid. The working pressure varies from 70 to 120 lbs. per sq. inch, according to the temperature of the surrounding atmosphere; and the projectile range of the jet is from 40 to 50 feet.

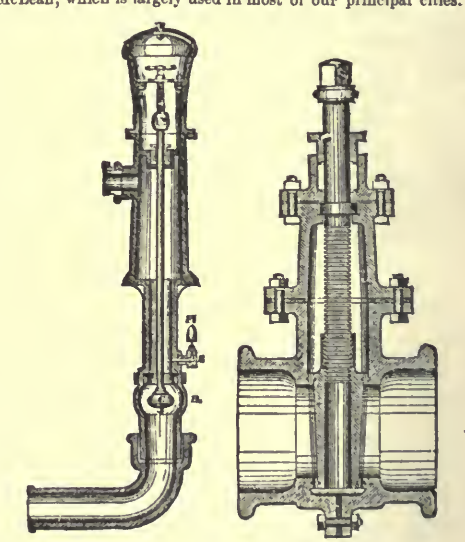
Fig. 187. — Fire-Extinguisher.

Fire-Guard, a wire frame to be hung before a fire-grate to prevent sparks and burning coals, etc., flying out and endangering furniture.

Fire-Hook, a large hook used by firemen for pulling down walls, etc., during the conflagration of a building.

Fire-Hydrant, or **Fire-Plug**, is a large kind of hydrant, having a larger service-pipe from the main, and used for connection of hose for street washing, or in case of fire.

In Fig. 188 is represented a sectional elevation of the improved fire-hydrant, originally introduced by Mr. Sam'l P. Ayres, and now owned and manufactured in New York by Mr. John McLean, which is largely used in most of our principal cities.



Fire-Hydrant. Stopcock.

Fig. 188. — Ayer's Fire-Hydrant and Stopcock.

A is the stock or case below the pavement, which is enlarged to such an extent at its lower end, B, that the area around the valve, C, is fully equal to the capacity of the nozzle, D; E is a waste-valve, perfectly automatic in its operation. When the valve is open, the pressure of the water acting on the lower side of the small valve in E closes the opening of the valve, and

as soon as the main valve, C, is closed, the pressure being removed from the bottom of the valve, the weight, F, causes the valve to drop from its seat, and permits the water in the stock to escape, thus preventing any liability to freeze. See HYDRANT and STOPCOCK.

Fire-Insurance. See INSURANCE (FIRE).

Fire-Irons, the utensils for a fire-grate, — tongs, poker, and shovel.

Firelock, a musket or other small arm, having a lock for igniting the charge by means of a flint and steel.

Fireman, a member of a fire-brigade or company. — The feeder of a furnace, marine or locomotive engine.

Fireman's Trust, a fire-insurance Co., located in Brooklyn, N. Y., organized in 1859. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $150,000; net surplus, $86,318.07; risks in force, $10,583,-196; premiums, $65,959.61; premiums received since the organization of the Co., $1,092,207.81; losses paid, $423,034.92; cash dividends paid to stockholders, $241.500.

Firemens, a fire-insurance Co., located in Baltimore, Md., and organized in 1825. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $378,000; net surplus, $112,490.90; risks in force, $18,694,356; premiums, $87,642.48; premiums received since the organization of the Co., $4,708,158.92; losses paid, $2,193,342 60; cash dividends paid to stockholders, $5,519,180.24.

Firemens, a fire-insurance Co., located in Dayton, O., organized in 1856. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $250,000; net surplus, $63,420.28; risks in force, $12,994,666; premiums, $140,029.36; premiums received since the organization of the Co., $1,191,027.06; losses paid, $410,869; cash dividends paid to stockholders, $339,892.40.

Firemens, a fire-insurance Co., located in Newark, N. J., organized in 1855. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $400,000; net surplus, $586,518.97; risks in force, $27,239,754; premiums, $214,383 86; premiums received since the organization of the Co., $2,538,973.92; losses paid, $702,807.16; cash dividends paid to stockholders, $390,500.

Firemens, a fire-insurance Co., located in New York City, organized in 1825. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $204,000; net surplus, $85,827.00; risks in force, $9,709,265; premiums, $47,520.57; premiums received since the organization of the Co., $4,019.275.28; losses paid, $2,520,555.62; cash dividends paid to stockholders, $1,301,-678.17.

Firemen's Fund, a fire-insurance Co., located in San Francisco, Cal., organized in 1863. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $300,000; net surplus, $124,-717.75; risks in force, $34,510-313; premiums, $453,880.75; premiums received since the organization of the Co., $5,534,-806; losses paid, $3,030,435.98; cash dividends paid to stockholders, $784,000.

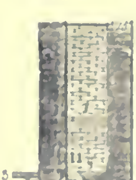


Fig. 189. — CHIMNEY-PIECE.

Fireplace, the place within a chimney-piece where fuel is burnt. The several parts of the chimney-piece, shown in Fig. 189, are: (1) the slab, (2) the hearth, (3) the jamb, (4) the fireplace, (5) the mantel-piece, (6) the throat, (7) the gathering, (8) the funnel, (9) the flue, (10) the mantel, (11) the back, (12) the grate, (13) the breast, (14) the damper.

Fire-Plug, a plug for drawing water from a pipe or hydrant for extinguishing a fire.

Fire-Proof, a vault, safe, or building so constructed as to be secure from the ravaging effects of fire, should it break out. If accidental fires could be prevented instead of extinguished, there would of course be a great improvement; but, so long as there are combustible materials and careless people, this is hopeless. Fire-proof construction is now carefully attended to in large buildings. Brick and stone walls; iron steps, lintels, ties, doors, and partitions; floors of concrete or iron, — in short, the absence as much as possible of timber, — such is the mode resorted to, and in many cases with success. But there are even here drawbacks, so far as iron is concerned: this metal conducts heat more rapidly than wood, while cast iron cracks and gives way. The management of the draught, too, in passages and staircases, has much to do with the travelling of flame and hot air from one floor or room to another. In fact, the best mode of fire-proof construction is still a problem. See INCOMBUSTIBLE FABRICS, SAFE, etc.

Fire-Screen, a wire guard or protection against fire. See FIRE-GUARD.

Fire-Set, the metal articles, poker, shovel, and tongs, for a grate; usually made of steel or wrought-iron.

Fire-Ship, a vessel filled with combustibles sent into an enemy's fleet to injure it.

Fire-Shovel, the coal-shovel for a fireplace.

Fire-Stop, the fire-bridge at the back of a furnace; so called because it prevents coals being pushed over.

Fire-Wood, small bundles of wood, in different shapes, prepared by machinery, for lighting fires; the sale of fire-wood has become a very important and extensive trade in New York and other populous cities.

Fireworks. See PYROTECHNY.

Firkin, an English measure of capacity, the fourth of a barrel, now disused; but the name is still applied to a cask containing nominally 9 gallons of beer or 8 of ale, but truly only 7½ imperial gallons. A firkin of soap is 64 lbs.; of butter, usually considered, 56 lbs.; but Irish butter-firkins weigh nearly ¾ of a cwt. gross, the cask weighing about 14 lbs.

Firlot, a Scotch dry measure, the fourth part of the boll; the Linlithgow wheat firlot is 2,211 cubic inches, very nearly equal to the imperial bushel, but the barley firlot contains 31 standard pints only, = 1,074.429 cubic inches.

Firm, the persons composing a copartnership taken collectively; a house of business; the abbreviated title under which a trade is conducted by a number of partners, as the firm of A. T. Stewart & Co. Under the laws of the State of New York no person may transact business in the name of a partner not interested in his firm, and where the designation "and Company" or "& Co." is used, it shall represent an actual partner or partners. But the business of two or more persons may be conducted under the firm name of but one person; or without the use of the name of either of the parties composing the firm, as the firm of James G. King's Sons. — *T. McElrath.*

Firman, an edict or legal authority from the Turkish government.

Firmer-Chisel, a chisel shorter than a paring-chisel, lighter than a framing-chisel, thin in proportion to its width, having a tang to enter the handle, and of which there are about twelve widths.

First Coat, in plastering, the *laying* the plaster on the laths, or the *rendering*, as it is called, on brick when only two coats are used. When three coats are used, it is called *pricking up* when upon laths, and *roughing in* when upon brick.

First-Hand, obtained direct from the maker, shipper, or wholesale dealer.

First-Mate, the chief officer of a merchant vessel; the next in rank to the captain.

First National Fire-Insurance Co., located in Worcester, Mass., and organized in 1868. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $14,663.15; risks in force, $9,392,165; premiums, $138,573.48. Premiums received since the organization of the Co., $1,229,309.03; losses paid, $757,614.98; cash dividends paid to stockholders, $74,000.

First-Rate, excellent; of superior quality. — One of the largest ships of war, a vessel carrying 100 or more guns.

Fisc, a law term, applied in France and other countries of Europe to the public treasury, which is entitled to all fines, forfeited goods, goods without an owner, etc.; whence our term *confiscation*.

Fiscal, pertaining to the public treasury, or to the revenues of a state; as, *fiscal* measure. — The *fiscal year* of the U. States formerly ended on 31st December, and, up to the year 1843, on 30th September; but Congress enacted, August 26, 1842, "That on and after the first day of July, in the year of our Lord 1843, the fiscal year of the treasury of the U. States, in all matters of accounts, receipts, expenditures, estimates, and appropriations, shall commence on the first day of July in each year; and the reports and estimates required to be prepared and laid before Congress at the commencement of each session by the Secretary of the Treasury, in obedience to the acts of Congress, of the 2d of September, 1789, and of May 10, 1800, shall be a a report and estimate for each fiscal year, commencing as aforesaid, and terminating on the 30th day of June, in the succeeding calendar year."

Fish [Dutch, *Visschen*; Fr. *poissons*; Ger. *Fische*; It. *pesci*; Port. *peixes*; Sp. *pescados*. The plural of the English word is *fishes*, but the singular is often used for fishes in general, or the whole race], a general name for marine swimming animals, which form the lowest class of the *Vertebrata*, and in the capture and sale of which a large trade is carried on. In the variety of their genera and species fishes are second only to the insects, whilst in prolificness and number they probably exceed all other animated beings that reach a size equal to that of even the smallest member of their prodigious race. Besides their value to man as food, they furnish him with oil, isinglass, and various other articles of utility and luxury, and provide, either directly or directly, an inexhaustible supply of manure for the fertilization of his fields. As food, fish are undoubtedly wholesome and nutritious, although less so than the flesh of animals or the grains of the cereals. Of all the various substances used as aliments by man, fish are, however, the most liable to run into a state of putrefaction, and should therefore be only eaten when perfectly fresh, or, if not recently taken, then only when their perfect preservation has been insured by any of the ordinary methods employed for the purpose. Those that are the whitest and most flaky when cooked, as cod, flounders, haddock, hake, soles, turbot, whiting, etc., are the most easily digested; and those abounding in oily matter, as eels, herrings, mackerel, salmon, etc., are most nutritious, though the most likely to offend the stomach. Salt-water fish have been said to be more wholesome than river fish, but without sufficient reason. Salted fish are hard of digestion, unless when carefully cooked and well masticated. Skin diseases are said to be more common among those who live continually on fish than among those who abstain from it; but this probably arises from their use being unaccompanied by a proper quantity of fresh vegetables or fruit, both of which are scarcer on the sea-coast than further inland. As one of the components of a mixed diet, the value of fish is indisputable. Acid sauces and pickles are the proper additions to fish, from their power of retarding the progress of putrefaction, and of correcting the relaxing tendency of large quantities of oil and butter. See SEA-FISHERIES, and PISCICULTURE.

Imp. duty: All foreign-caught fish, not in barrels or half-barrels, and not otherwise provided for, 50 cts. per 100 lbs. — All fresh fish for immediate consumption, free. — All fish in oil, not otherwise provided for, 30 per cent. — Fish of all kinds, the product of the sea-fisheries of Newfoundland (fish in bond excepted), free. — All pickled fish, in barrels, excepting herrings, mackerel, and salmon, $1.50 per bbl. — Codfish, dried, ½ ct. per lb. — Fish for bait, free. — Herrings, pickled or salted, $1 per bbl., or 50 cts. per 100 lbs. — Living fish, 20 per cent. — Mackerel, $2 per bbl. — Fish in kits, 1 ct. per lb. — Fish of American fisheries, free. — Prepared fish, 35 per cent. — Fish preserved in oil, not otherwise provided for, 30 per cent. — Salmon, pickled, $3 per bbl.: preserved, 30 per cent.

In the U. States, a barrel of fish is 200 lbs. net, exclusive of salt or brine.

Fish, a sea-term for strengthening a weakened spar by fastening other pieces on. — To raise the flukes of an anchor on the gunwale, or vessel's side. — To catch fish by net, or by hook and line.

Fish-Bar, the splice-bar which breaks the joint of two meeting objects, as of railroads, rails, or scarfed timber.

Fish-Beam, a beam with a bulging belly.

Fish-Block, the block of the fish-tackle for raising the anchor.

Fish-Carle, a Scotch fisherman.

Fish-Carver, a silver knife for helping fish at a dinner-table.

Fish-Curer, a salter and smoker of fish.

Fish-Davit, in ship-building, a spar or small crane projecting from the bow of a ship for the suspension of the tackle, called the *fish-fall*, used in hauling up the arms of the anchor in getting it aboard. The fish-davit is such a distance abaft the *cathead* as the length of the anchor may require, and is used to lift the fluke of the anchor to the bill-board; a roller keeps the fluke from bruising the vessel's side.

Fisher, a name for the *Mustela canadensis*; the skin is principally used for trimmings and linings, the fur being long, fine, and lustrous, but not so valuable as the sable. The tail is extensively used by the Jews.

Fisheries. See SEA-FISHERIES and WHALE-FISHERY.

Fisherman, one who follows the business of catching fish for sale.

Fisherman's-Bend, a sailor's knot, used in binding halyards to a studding-sail yard. Two turns are taken round the spar, the end passed between them and the spar, and half hitched around the standing part.

Fish-Fag, a fisherman.

Fish-Flake, a structure on which fish are spread to be air and sun dried.

Fish-Gig, a kind of harpoon or spear, with several barbed prongs, attached to a line, used for striking fish at sea.

Fish-Glue. See ISINGLASS.

Fish-Hook [Fr. *hameçon ;* Ger. *Fischangel*], a barbed instrument of various size and form, for catching fish (Fig. 190). They were formerly largely imported from Redditch, in Worcestershire, England; but they are now manufactured in New York, Brooklyn, and other places in the U. States. The barbs of the American fish-hooks, being better formed than those of the English, are pretty largely exported. *Imp.* duty, 30 per cent.

They are constructed with simple tools, but require great manual dexterity in the workmen. The iron wire of which they are made should be of the best quality, smooth and sound. A bundle of such wire is cut in lengths, either by shears or by laying it down upon an angular wedge of hard steel fixed horizontally in a block or anvil, and striking off the proper lengths by the blows of a hammer. In fashioning the *barbs* of the hooks, the straight piece of wire is laid down in the groove of an iron block made on purpose, and is dexterously struck by the chisel in a slanting direction, across so much of the wire as may be deemed necessary. A sharp-pointed little wedge is thus formed, whose base graduates into the substance of the metal. The end of the wire where the line is to be attached is now flattened or screw-tapped; the other end is sharp-pointed, and the proper twisted curvature is given. The soft iron hooks are next case-hardened, to give them the steely stiffness and elasticity, by imbedding them in animal charcoal contained in an earthen or iron box; after which they are brightened by heating and agitating them with bran, and finally tempered by exposure to a regulated temperature upon a hot iron plate. Hooks for salt-water fishing are frequently tinned, to prevent them wearing rapidly away in rust.

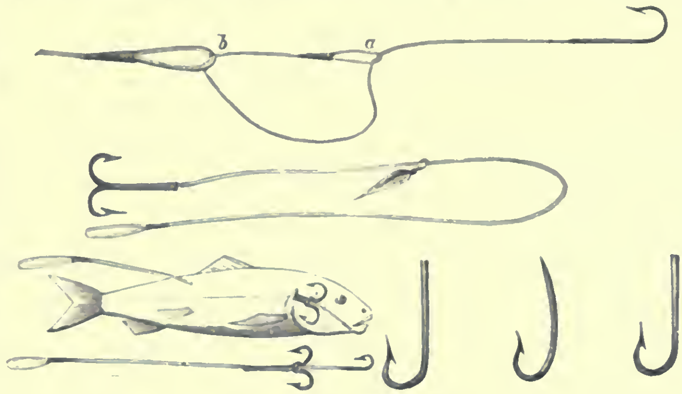


Fig. 190. — Fish-Hooks.

Fishing, the art or practice of taking fish. — Used or employed in fishing, or by fishermen; as a *fishing-rod*, a *fishing-boat*, etc. — In machinery, uniting by clamping between two short pieces which cover the joint. — On board ship, lifting the anchor-fluke on to and over the gunwale.

Fishing-Boat, a small decked or undecked boat in which the pursuit of fish is carried on.

Fishing-Line, small cord of different sizes, with, in some instances, gut or chain attached, to which a hook is appended, for river or sea fishing (*d*, Fig. 191).

Fishing-line Reel, a little winch, usually attached to a fishing-rod, and upon which the line is wound.

Fishing-Net. See Net.

Fishing-Rod, a rod for fishing (Fig. 191), usually made of bamboo lengths, fastened together by telescopic or screw couplings.

Fig. 191. — Fishing-Rod.

Fishing-Smack, a sloop having a water-chamber in the hold to keep fish alive.

Fishing-Tackle, the various appliances for angling and fishing, including fish-hooks, rods, reels, reel-lines, casting-lines, gut-lines, baits, artificial flies, salmon flies, baskets, bags, fly-boxes, floats, nets, harpoons, spears, forks, lesters, stakes, weirs, etc. In the U. States the fishing-tackle business is very extensive, and is chiefly centred and conducted in Fulton Street, New York.

Fishing-Tube, in microscopy, an open-ended glass tube for selecting a microscopic object in a fluid. The tube is closed at the upper end by the finger until the lower end is close to the object. The finger being raised, the water rushes in, carrying the object with it. — *E. H. Knight.*

Fish-Kettle, an oblong metal boiler, for cooking fish in.

Fish-Knife, a broad flat silver or plated knife for serving fish with at table.

Fishmaw, the sound of a fish. In the eastern seas a large trade is carried on in fishmaws, which are sent to China and used as glue, etc.

Fishmonger, a general dealer in fish.

Fish-Oil, a general name for the oil obtained from various marine animals and fishes, — from the livers of sharks in warm regions; from cod, ray, pilchards, and other large and small fish; from the seal, sea-elephant, dugong, etc. The leading fish-oil of commerce, however, is whale-oil.

Fish-Plate, a small plate of wrought-iron used to secure together the ends of the iron rails on railroads, to hold them strictly in line, avoiding deflection or sagging.

Fish-Pot, a wicker basket or enclosure sunk with a cork float attached, for catching crabs, lobsters, etc.

Fish-Salesman, one who receives consignments of fish for sale to retail dealers.

Fish-Sauces, anchovy, soy, and other condiments, used as flavorings for cooked fish.

Fish-Scales, the coating of some kinds of fish; the hard scales are now frequently used for making brooches, bracelets, and ornamental flowers, etc. The scales of the bleak are dissolved to coat the inner surface of glass beads or artificial pearls.

Fish-Slice, a silver perforated table instrument for serving fish.

Fish-Skin, the covering of the flesh of marine animals. The rough skin of the dog fish or shark is used by the cabinet-maker, type founder, and others, as an abrasive material for smoothing wood-work and metals. A kind of shagreen is made of fish-skin. The skin of the porpoise, beluga, seal, etc., are tanned; eel skins are used for making strong ropes, for connecting the swiple and hand staff of a threshing flail, and for other purposes. Sole skins and some others are used for clarifying coffee and liquors.

Fish-Sound, the swimming-bladder of a fish, many of which are prepared for isinglass; others, as cod-sounds, are salted for food; some are sold to the Chinese under the name of fishmaws.

Fish-Strainer, a metal colander with handles, for taking fish from a boiler. — An earthenware slab with holes, placed at the bottom of a dish, to drain the water from cooked fish.

Fish-tail Burner, a gas-jet which assumes a two-lobed form, like the tail of a fish.

Fish-tail Propeller, a single-winged propeller hinged to the stern-post and oscillating like the tail of a fish.

Fish-Wear, a dam in a river, or on the sea-shore, for stopping fish.

Fitch, a common name for the polecat, an European animal of the weasel tribe, the skin of which is much used for fur.

Fitchburg R.R. runs from Boston to Fitchburg, Mass., a distance of 50 m., with the following branches: Watertown, from North Cambridge to Waltham, 6.60 m.; Charlestown, 0.68 m.; Lancaster and Sterling, from South Acton to Marlborough, 12.42 m.; Peterborough and Shirley, from Ayer, Mass., to Mason, N. H., 23.62 m. The company also leases and operates the following lines: Vermont and Mass. R.R., from Fitchburg to Greenfield, 56 m., with branch to Turners Falls, 2.80 m., and the Troy and Greenfield R. R., from Greenfield to North Adams, 37 m., making a total of 189.12 m. operated. The offices of the Co. are in Boston, Mass. *Financial Statement:* Cap., stock, \$4,500,000; funded debt, \$1,000,000, consisting of \$500,000 7% bonds, payable 1894, and \$500,000 6%, payable 1897.

Fitter, in England, a coal-broker. — A weigher at the mint. — A tailor, one who tries on and adjusts articles of dress. — A gas-fitter is one who lays on pipes to houses, etc. — An out-fitter is a storekeeper who keeps ready-made garments on sale, or procures them properly made to order, etc.

Fittings, store fixtures; tackle for a ship; equipments; etc.

Five-Twenties, bonds issued by the U. States in 1862, 1864, and 1865, bearing interest at the rate of 6 per cent per annum, and redeemable at the pleasure of the government after five years, and payable twenty years from date. Total amount issued, \$843,660,150; total amount outstanding June 30, 1878, \$875,300. See NATIONAL DEBT.

Fixature, a gummy composition for the hair. See BANDOLINE.

Fixed Oils, the common greasy oils are so called from the high temperature they sustain before decomposing and giving off vapor. See FAT and OIL.

Fixing, in shipbrokers' parlance, in reference to a ship, finding it a freight; and, in reference to a freight, finding it a ship. — In photography, the cleansing of photographs from the sensitive layer not acted on by the light. The principal fixing agents are hyposulphate of soda, which may be used either for glass or paper pictures, and cyanide of potassium, which can be used only for the former.

Fixtures, the more permanent furniture of a counting-house or store, as the counters, desks, drawers, gas-burners, etc.

Flacket, a barrel-shaped bottle.

Flacon, Flagon, a flask or decanter; a carafe; a vessel with a narrow mouth; a smelling-bottle.

Flag, the ensign borne on the mast of a ship to designate the country to which it belongs; in the navy it is likewise made to denote the rank of the officer by whom the ship is commanded. Different significations are also attached to plain flags of one simple color: thus, a yellow flag indicates that there is sickness of a dangerous character on board the vessel which bears it, or that the ship is performing quarantine; a white flag is well known among all nations as a flag of truce, and betokens a desire for a temporary cessation of hostilities, for the purpose of communication between hostile parties, or for burying the dead slain in battle; a black flag, on the other hand, is the emblem of piracy, or betokens a determination, on the part of those who hoist it, to resist to the last, and to give or take no quarter. When a flag is hoisted half-mast high, it is a mark of mourning; when it is hoisted upside down, it forms a signal of distress. A blue flag, with a square white centre, called the blue Peter, is hoisted when a vessel is about to sail, and is the signal of departure. A short triangular flag is called a burgee; a longer flag, of the same shape, a signal pendant; a square flag, with a triangular piece cut out of the end farthest from the halyards, with the point turned towards the centre, a cornet; and a very long narrow flag, resembling a strip of ribbon tapering to a point, which is borne at the mast-head, is called a pendant.

By the Act entitled "An Act to establish the flag of the United States," passed April 4, 1817, it was enacted: 1. That from and after the 4th of July, 1818, the flag of the U. States be 13 horizontal stripes, alternate red and white; that the union be 20 stars, white in a blue field. 2. That on the admission of every new state in the Union, one star be added to the union of the flag; and that such addition shall take effect on the 4th day of July then next succeeding such admission.

Flageolet, a small wooden musical instrument, played on by means of a mouthpiece, and furnished with holes or keys for fingering.

Flail, an instrument for threshing corn, consisting of the hand-staff, or piece held in the thresher's hand; a swiple, or that part which strikes the corn; the caplins, strong leathern thongs, which unite the hand-staff and swiple; and the middle-band, a leathern thong or fish-skin that ties the caplins together.

Flake-White, a sub-nitrate of bismuth. — Also a name for oxidized carbonate of lead in the form of scales or plates. When levigated, it is called body-white.

Flambeau, a kind of torch made of thick wicks, covered with wax, and used in the streets at night, at illuminations, and in processions. Flambeaux usually consist of four wicks or branches, about an inch in thickness, and three feet long, made of coarse half-twisted hempen yarn; and these, being suspended by one end, are coated with white or yellow wax, which is poured over them from a ladle until the requisite thickness be obtained.

Flame, gas or vapor in an incandescent state. The light emitted from pure flame is exceedingly feeble; illuminating power being almost entirely dependent upon the presence of solid matter. See ILLUMINATION.

Flamingo, a water-bird conspicuous for the bright scarlet or flame-colored patch upon its wings. Its body is smaller than that of the stork; but owing to the great length of neck and legs, it stands nearly five feet high, and measures six feet from the point of the beak to the tips of the claws. The *F.* of tropical America (*Phœnicopterus ruber*) migrates in summer to the Southern States. Its plumage, which is of a deep red, is highly esteemed and always in demand.

Flange, in machinery, a projecting rim or rib.

The metal rim bent over in gas-pipes, water-pipes, etc., in order to join on to other lengths of the same. The term is also applied to the projecting outside circumference of a railway-carriage wheel, by which the wheel is prevented from running off the rails.

Flannel [Fr. *flanelle;* Ger. *Flanel*], a soft, open, woollen stuff, of which there are many kinds, milled, gauze, colored and checked, cricketing and house *F.*, blankets, etc. The manufacture of *F.*, which is very large, both in this country and in England, is almost the same as that of other woollen goods, though there are certain wools which are more used for *F.* than for any other textiles.

F. is highly recommended by medical men as a clothing, both in hot and cold countries. It acts as a gentle stimulus on the skin, and exercises the most beneficial action, by keeping the pores clean, and in a state most favorable to perspiration. This action is a species of friction similar in character, although inferior in degree, to that of the common flesh-brush or horse-hair glove, so long employed as a skin stimulant. *F.* has also the advantage of absorbing the perspiration as soon as emitted, and allowing its watery portion to pass off into the atmosphere almost as soon as formed, but this is not the case with cotton and linen fabrics. The different effects of *F.* and linen are particularly susceptible during brisk exercise. When the body is covered with the former, though perspiration be necessarily increased, the perspired matter freely passes off through the *F.*, and the skin remains dry and warm. If the same exercise be taken in linen shirts, perspiration, as in the former case, is indeed also increased, but the perspired matter, instead of being dispersed into the atmosphere, remains upon the linen, and not only clogs the pores of the skin, but gives a disagreeable sensation. From this property of *F.*, persons who wear it next the skin seldom catch cold from changes of temperature, even though perspiring profusely; but in similar cases, when linen or calico shirts are worn, chilliness immediately comes on, followed by snifiling, sneezing, and cough, and all the other symptoms of severe catarrh. — In washing *F.* it is recommended that they should only be put into warm water, by which method their color will be preserved, and they will be prevented from shrinking.

Imp. duty: wholly or part of wool, worsted, the hair of the alpaca goat, or other like animals, valued not over 40 cts. per lb., 20 cts. per lb. and 35 per cent; valued over 40 and not over 60 cts. per lb., 30 cts per lb. and 35 per cent; valued over 60 and not over 80 cts. per. lb., 40 cents per lb. and 35 per cent; valued over 80 cts per lb., 50 cts. per lb. and 35 per cent. — Flannel shirting, 50 cts. per lb. and 35 per cent.

Flap, a hinged leaf of a table or shutter.

Flaring, overhanging, as of the bows of a ship, the top side forward.

Flash, a liquor used to color spirits, and to give them a false strength. It is usually labelled *isinglass and burnt sugar.* Its composition is as follows: burnt sugar coloring, 1 gall.; fluid extract of capsicum or essence of cayenne, ½ pint, or enough to give a strong, fiery taste.

Flashing, in plumbing, a lap joint used in sheet-metal roofing, where the edges of the sheets meet on a projecting ridge; also a strip of lead leading the drip of a wall into a gutter.

Flask, a metal or other pocket dram-bottle. — A measure for holding gunpowder. — A shallow iron frame or casting-box, without top or bottom, used in foundries for moulding; the lower flask is called a drag. — A globular glass vessel for holding liquids, containing about half a gallon; in Holland 16 flasks make an anker. The flask of quicksilver from California is about 75 lbs.

Flasket, a long shallow basket with two handles.

Flat, a description of river-boat for conveying merchandise, which usually carries from 80 to 120 tons; those worked by the captains or owners are termed No. 1 flats. — Tasteless; vapid; insipid. — Lacking life and animation; depressed; as, the market is flat. — A stock-exchange term used to express the price of bonds, etc., when the sales are made without reference to accumulated interest. — A rough piece of bone for a button-mould. — To preserve gilding by size. — A story or floor of a building, sometimes constructed so as to accommodate a family having the necessary suite of rooms, commonly called *French flat.* In New York, and some other large towns, houses are specially built for letting in these kinds of flats or floors with one common staircase.

Flat-Bottomed, a vessel with an even lower surface and but small depth.

Flat-Cap, a size of writing paper, usually 14 × 17 inches, put up in reams and bundles without being folded, and chiefly used for blank books

Flats, plaited or braided straw, sewed and ready to be put in shape for bonnets or hats

Flat-Iron, Flattening-Iron, a laundress's or workman's smoothing-iron.

Flatting, the operation of smoothing. — A mode of house-painting in which the color on the surface is left without gloss.

Flatting-Mill, a mill for rolling out metals by cylindrical pressure.

Flat-Tool, a turning-chisel used as a bottoming-tool in making boxes. It cuts on both sides, and on the end, which is square.

Flavine, a vegetable extract, in the form of a light-brown or greenish-yellow powder, which contains much coloring matter and tannin, and takes the place of quercitron bark. It gives a fine olive-yellow color to cloth.

Flaw, a crack; a fracture or defect in metals, gems, timber, etc.

Flax [Fr. *lin*; Ger. *Flachs:* It. and Sp. *lino;* Port. *linho*], an annual plant of fragile appearance, sending up slender fibrous stalks, two or three feet high, with narrow alternate leaves and delicate blue flowers (Fig. 192). These are followed by globular, many-celled seed-vessels, containing bright, slippery, brown seed, flattened and elongated. The stalks of this plant are hollow pipes, surrounded by a fibrous rind, the filaments of which furnish to the manufacturer the material for cambric, linen, and other similar fabrics. The frequent mention of fine linen in Scripture, and the evidence which is afforded by the unrolling of Egyptian mummies that the fine linen of Egypt was actually woven from flax, is sufficient to prove that the same plant which we now employ furnished one of the most ancient manufactures known. For many ages, even down to the early part of the 14th century, Egyptian flax occupied the foremost place in the commercial world, being

Fig 192. — Flax.

sent in all regions with which open intercourse was maintained. Among Western nations it was, without any competitor, the most important of all vegetable fibres till towards the close of the 18th century, when, after a brief struggle, cotton took its place as the supreme vegetable fibre of commerce.

When flax is cultivated primarily on account of the fibre, the crop ought to be pulled before the capsules are quite ripe, when they are just beginning to change from a green to a pale brown color, and when the stalks of the plant have become yellow throughout about two thirds of their height. The various operations through which the crop passes from this point till flax ready for the market is produced are: (1) pulling, (2) rippling, (3) retting, and (4) scutching.

Pulling and *rippling* may be dismissed very briefly. Flax is always pulled up by the root, and under no circumstances is it cut or shorn like cereal crops. The pulling ought to be done in dry, clear weather: and care is to be taken in this, as in all the subsequent operations, to keep the root-ends even and the stalks parallel. At the same time it is desirable to have, as far as possible, stalks of equal length together, — all these conditions having considerable influence on the quality and appearance of the finished sample. As a general rule, the removal of the bolls or capsules by the process of *rippling* immediately follows the pulling, the operation being performed in the field; but under some systems of cultivation, as, for example, the Courtrai method, alluded to below, the crop is made up into sheaves, dried, and stacked, and is only bolled and retted in the early part of the next ensuing season. The best rippler, or apparatus for rippling, consists of a kind of comb having, set in a wooden frame, iron teeth made of round-rod iron $\frac{3}{16}$ of an inch asunder at the bottom, and $\frac{1}{2}$ an inch at the top, and 18 inches long, to allow a sufficient spring, and save much breaking of flax. The points should begin to taper 3 inches from the top. A sheet or other cover being spread on the field, the apparatus is placed in the middle of it, and two ripplers sitting opposite each other, with the machine between them, work at the same time. It is unadvisable to ripple the flax so severely as to break or tear the delicate fibres at the upper part of the stem. The two valuable commercial products of the flax-plant, the seeds and the stalk, are separated at this point. We have here to do with the latter only.

Retting, or *rotting*, is an operation of the greatest importance, and one in connection with which in recent years numerous experiments have been made, and many projects and processes put forth, with a view of remedying the defects of the primitive system or altogether supplanting it. From the earliest times two leading processes of retting have been practised, termed respectively water-retting and dew-retting; and as no method has yet been introduced which satisfactorily supersedes these operations, they will first be described. — *Water-retting*. For this — the process by which flax is generally prepared — pure soft water, free from iron and other materials which might color the fibre, is essential. Any water much impregnated with lime is also specially objectionable. The dams or ponds in which the operation is conducted are of variable size, but should be not more than 4 feet in depth. It is calculated that a dam 50 feet long, 9 feet broad, and 4 feet deep is sufficient to ret the produce of an acre of flax. The rippled stalks are tied in small bundles and packed, roots downwards, in the dams till they are quite full; over the top of the upper layer is placed a stratum of rushes and straw, or sods with the grassy side downwards, and above all stones of sufficient weight to keep the flax submerged. Under favorable circumstances a process of fermentation should immediately be set up, which soon makes itself manifest by the evolution of gaseous bubbles. After a few days the fermentation subsides, and generally in from ten days to two weeks the process ought to be complete; but everything depends upon the weather, and, as the steeping is a critical operation, it is essential that the stalks be frequently examined and tested as the process nears completion. When it is found that the fibre separates readily from the woody "shive" or core, the beets or small bundles are ready for removing from the dams. It is next spread, evenly and equally, over a grassy meadow, where it is left for about a fortnight, at the end of which time the fibres will have partly separated from the core and "bowed." At this point advantage is taken of fine dry weather to gather up the flax, which is now ready for scutching, but the fibre is improved by stooking and stacking it for some time before it is taken to the scutching-mill. — *Dew-retting* is the process by which all the Archangel flax and a large portion of that sent out from St. Petersburg are prepared. By this method the operation of steeping is entirely dispensed with, and the flax is, immediately after pulling, spread on the grass, where it is under the influence of air, sunlight, night-dews, and rain. The process is tedious; the resulting fibre is brown in color, and is said to be peculiarly liable to undergo heating (probably owing to the soft heavy quality of the flax) if exposed to moisture and kept close placed with little access of air. Archangel flax is, however, peculiarly soft and silky in structure, although in all probability water-retting would result in a fibre as good or even better in quality.

The theory of retting, according to the investigations of J. Kolb, is that a peculiar fermentation is set up under the influence of heat and moisture, resulting in a change of the intercellular substance — pectose, or an analogue of that body — into pectine and pectic acid. The former, being soluble, is left in the water, but the latter, an insoluble body, is in part attached to the fibres, from which it is only separated by changing into soluble metapectic acid under the action of hot alkaline lye in the subsequent process of bleaching. — To a large extent retting continues to be conducted in the primitive fashions above described, although numerous and persistent attempts have been made to improve upon it, or to avoid the process altogether. The uniform result of all experiments has only been to demonstrate the scientific soundness of the ordinary process of water-retting, and all the proposed improvements of recent times seek to obviate the tediousness, difficulties, and uncertainties of the process as carried on in the open air. The only modification of water-retting which has hitherto endured the test of prolonged experiment, and taken a firm position as a distinct improvement, is the warm-water retting, patented in America in 1846 by Robert B. Schenck. For open pools and dams Schenck substitutes large wooden vats under cover, into which the flax is tightly packed in an upright position. The water admitted into the tanks is raised to and maintained at a temperature of from 75° to 95° F. during the whole time the flax is in steep. In a short time a brisk fermentation is set up, gases, at first of pleasant odor, but subsequently becoming very repulsive, being evolved, and producing a frothy scum over the surface of the water. The whole process occupies only from 50 to 60 hours. A still further improvement, due to Mr. Pownall, comes into operation at this point, which consists of immediately passing the stalks, as they are taken out of the vats, between heavy rollers over which a stream of pure water is kept flowing. By this means, not only is all the slimy glutinous adherent matter thoroughly separated, but the subsequent processes of breaking and scutching are much facilitated.

A process of retting by steam was introduced by W. Watt, of Glasgow, in 1852, and subsequently modified and improved by J. Buchanan. The system possessed the advantages of rapidity — being completed in 10 hours — and freedom from any noxious odor; but it yielded only a harsh, ill-spinning fibre, and consequently failed to meet the sanguine expectations of its promoters.

Scutching is the process by which the fibre is freed from its woody core and rendered fit for the market. For ordinary water-retted flax two operations are required, first *breaking* and then *scutching*, and these are done either by hand-labor or by means of small scutching or lint mills, driven either by water or steam power. Hand-labor, aided by simple implements, is still much used in Europe; but the use of scutching-mills is now very general, these being more economical, and turning out flax of a much better quality. The breaking is done by passing the stalks between grooved rollers, to which in some cases a reciprocating motion is communicated, and the broken shives are beaten out by suspending the fibre in a machine fitted with a series of revolving blades, which, striking violently against the flax, shake out the bruised and broken woody cores. A great many modified scutching machines and processes have been proposed and introduced with the view of promoting economy of labor and improving the turn-out of fibre, both in respect of cleanness and in producing the least proportion of codilla, or scutching tow. Among them, and, we think, the most effective, is the *Breaking and Scutching Machine* lately introduced in the U. States by the editor of this work, and now owned by Mr. J. F. Dunton of Philadelphia.

Dressing. We have now to follow the scutched fibres to the great mills, where machinery does almost everything.— *Dividing*. The individual fibres, varying from 24 to 36 inches long, have different degrees of fineness at different parts; they are therefore divided into three, four, or five pieces each, to suit as many different kinds of manufacture. The flax is held between two side-wheels, and torn across by the edge of a revolving centre-wheel. The action is that of *tearing*, not *cutting*; since it is found that the spinning quality of the fibre is injured by a sharp transverse cut. — *Heckling*. The *heckle*, or *hackle*, is an iron comb, the teeth of which are very sharp, and are placed upright. The heckler, taking a lock of flax by the middle in his right hand, draws each half of the length repeatedly between the teeth of the comb, regulating the position of the flax with his left hand. This is done first on a coarse heckle, and then on a finer. The combed and straightened fibres are now called *line*, and the coarser and broken fibres *tow*. 100 lbs. of scutched flax produce rather more than 50 lbs. on an average of line, the rest being tow, boon, and dust. In the larger mills this process is now done by the *heckling-machine*. Heckles, or combs, are ranged round the circumference of a large cylinder; the fibres are fixed in a flat layer to a *flax-holder*, several such holders are adjusted to the machine, and their rotary action speedily heckles a large quantity of flax. Children are employed to fill and empty, place and replace, adjust, and manage the flax-holders; all else is conducted automatically. Revolving brushes of bristle clean

off any refuse tow from the teeth of the heckles. — *Sorting.* The line is divided by skilful sorters into as many as half a dozen different degrees of fineness, partly by the eye and partly by the touch: and each quality is rapidly placed in a separate compartment by itself. — *Spreading, Drawing, and Roving.* The sorted line is next converted into ribbons, or slivers. For this purpose it is spread upon a feeding-cloth in such a manner that the ends of the second strick reach the middle of the first. In this way a uniform thickness is preserved, since the heckled stricks are thicker in the middle than at the ends. The flax is then passed between one pair of rollers, which deliver it through-gills or heckling-points to a second pair, which, moving with much greater speed than the first, increase the length and diminish the thickness of the flax. During this operation

Fig. 193. — Spreading-Frame.

the flax receives no twist, but is converted into a flat, narrow tape or ribbons, which is received into a tin can. When the can is full it is taken to a drawing or *spreading* frame (Fig 193), where a number of slivers are united and drawn into one length. The frames are attended by young women, each of whom has the charge of four. The slivers next go to the *roving-frame*, where they receive a slight degree of twist and are wound upon bobbins preparatory to spinning.

Spinning. The spinning of flax differs little from the throstle-spinning of cotton (see Cotton), but the fibres of flax have not the same tendency to entangle themselves together as those of cotton, therefore it is necessary to moisten them with water to make them adhere to each other, and also to make them more pliable and easy to twist. Formerly the flax for machine-spinning was moistened with cold water, but a great improvement has been effected by substituting water at the temperature of 120°, which allows a much finer and more uniform thread to be spun, and double the length to be obtained from a given weight of flax. The warm water is contained in a trough, which extends the whole length of the spinning-frame, and the rapid motion of the spindle causes a dewy spray to be continually thrown off A great inconvenience was for a time experienced by the attendants, whose clothes were completely wetted in an hour or two by this minute spray, but the use of water-proof aprons has been found a sufficient remedy. This operation, however, produces a hot steaming atmosphere, which is painful to casual visitors of a flax-mill, though not unpleasant to the operatives. — The yarn, by doubling, is made into linen thread, which is bleached and formed into balls or reels. The yarn itself is wound upon reels and then made up into leas, banks, bundles, etc., as in the following invoice.

Two and a Half Yard Reel.

120 threads of 2½ yards....	300 yards, or one lea.
10 leas	3,000 yards, or 1 hank.
20 hanks..................	60,000 yards, or 1 bundle.

(Three bundles are usually put together in one bunch.)

One and a Half Yard Reel.

100 threads, or 1½ yard....	150 yards, or half a lea.
10 half-leas	1,500 yards, or 1 hank
40 hanks	60,000 yards, or one bundle.

(Six bundles are usually put together in one bunch.)

The fineness of linen yarn is reckoned by the number of leas to the pound weight In sorting line, the various qualities are divided into 2, 3, 3½ pounds, etc, as above mentioned In linen yarns the bundle of 60,000 yards is sometimes called by its number of leas per lb, or by the weight of the bundle. Thus a bundle of 25 leas to the lb. weighs 8 lbs.; a bundle of 50 leas to the lb. weighs 4 lbs.; a bundle of 100 leas to the lb. weighs 2 lbs.; so that 8 lbs. and 25 leas, and 4 lbs. and 50 leas, and 2 lbs. and 100 leas, are synonymous terms, as far as the size is concerned. In sorting, a certain quality of line will spin to a certain size or weight per bundle, and it was formerly the custom of line-sorters to call certain qualities 2 lbs., 3 lbs., 3½ lbs, 4 lbs, etc., because that quality of line would spin to that weight per bundle The same standard and name are still retained by line-sorters for the same quality of line; but from improvements in machinery, and other causes, 5½ line can now be spun to the size of 3 lbs. the bundle, and even finer.

Weaving. When flax has once been spun into yarn, its subsequent applications are very numerous. Some is twisted into *thread*, for sewing or for lace-making Some (and this the greater portion) is woven into *linen*. Other flax goods are *duck, drill, check, drabbet, tick, huckaback, diaper, damask, towelling, sheeting, dowlas, sacking, sail-cloth*; while a much-used combination of flax with cotton is called *union*. Variations in the quality of the flax, the thickness and closeness of the yarn, the mode of dressing, the arrangement and movements of the loom in dressing, and the finishing operations combine to bring about the difference in these several kinds of goods. *Jute* has lately come into competition with flax for some of the coarser varieties. See Loom, and Weaving.

The celebrated Courtrai flax of Belgium is the most valuable staple in the market, on account of its fineness, strength, and particularly bright color. There the flax is dried in the field, and housed or stacked during the winter succeeding its growth, and in the spring of the following year it is retted in crates sunk in the sluggish waters of the river Lys. After the process has proceeded a certain length, the crates are withdrawn, and the sheaves taken out and stooked. It is thereafter once more tied up, placed in the crates, and sunk in the river to complete the retting process; but this double steeping is not invariably practised. When finally taken out, it is unloosed and put up in cones, instead of being grassed, and when quite dry it is stored for some time previous to undergoing the operation of scutching. In all operations the greatest care is taken, and the cultivators being peculiarly favored as to soil, climate, and water, Courtrai flax is a staple of unapproached excellence.

An experiment made by Professor Hodges of Belfast on 7,770 lbs. of air-dried flax yielded the following results: By rippling he separated 1,946 lbs. of bolls, which yielded 910 lbs. of seed. The 5,824 lbs. (52 cwt.) of flax straw remaining lost in

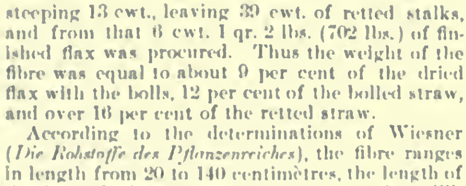


Fig. 194. — Fibre of Rough Russian Flax (*magnified*).

steeping 13 cwt., leaving 39 cwt. of retted stalks, and from that 6 cwt. 1 qr. 2 lbs. (702 lbs.) of finished flax was procured. Thus the weight of the fibre was equal to about 9 per cent of the dried flax with the bolls, 12 per cent of the bolled straw, and over 16 per cent of the retted straw.

According to the determinations of Wiesner (*Die Rohstoffe des Pflanzenreiches*), the fibre ranges in length from 20 to 140 centimètres, the length of the individual cells being from 2.0 to 4.0 millimètres, and the limits of breadth between 0.012 and 0.025 mm., the average being 0.016 mm.

Among the circumstances which have retarded improvement both in the growing and preparing of flax, the fact that, till comparatively recent times, the whole industry was conducted only on a

domestic scale has had much influence. At no very remote date it was the practice in Scotland for every small farmer and cotter not only to grow "lint," or flax, in small patches, but to have it retted, scutched, cleaned, spun, woven, bleached, and finished entirely within the limits of his own premises, and all by members or dependants of the family. The same practice obtained in the U. States. Outside of the cities and of the homes of great planters there was scarcely a housewife or damsel of whom it might not be said, "She layeth her hands to the spindle, and her hands hold the distaff." From a series of papers written between 1787 and 1791 by Mr. Tench Coxe, Commissioner of the Revenue, and for several years Assistant Secretary of the Treasury, it appears that manufactures from flax and hemp had become an established and very important industry; he enumerates, among articles "manufactured in a household way," seines and nets of various kinds, twine and packthread, sail-cloth, tow-cloth, white and checked shirtings, sheetings, towelling, table-linen, bedticks, hosiery, sewing-thread, and seine-thread lace. Among the flax products "manufactured in a family way" in Massachusetts and Rhode Island, during the first 9 months of 1791, Mr. Coxe specifies 25,265 yards of linen cloth. The census of 1810 returned 21,211,262 yards of flaxen cloths made in families; of this, New York produced 5,303,000 yards; Virginia, about 5,000,000; Pennsylvania, 3,000,000; Connecticut, 2,250,000; New Hampshire, 1,000,000. Thus the flax industry was long kept away from the most powerful motives to apply to it labor-saving devices, and apart from the influence of scientific inquiry for the improvement of methods and processes. As cotton came to the front just at the time when machine-spinning and power-loom weaving were being introduced, the result was that in many localities where flax crops had been grown for ages the culture gradually drooped and ultimately ceased. The linen manufacture by degrees ceased to be a domestic industry, and began to centre in and become the characteristic factory employment of special localities, which depended, however, for their supply of raw material primarily on the operations of small growers, working, for the most part, on the poorer districts of remote, thinly populated countries. The cultivation of the plant and the preparation of the fibre have, therefore, even at the present day, not come under the influence (except in certain favored localities) of scientific knowledge and experience, and the greater part of the flax in use at the present moment is prepared precisely by the processes employed in Egypt when the descendants of Jacob dwelt in the land of Goshen.

In England and Scotland the acreage under flax is now so limited, and it has decreased with such steadiness and rapidity, that, as a crop, flax may be regarded as practically extinct in these countries. In Ireland the cultivation of flax has always occupied a relatively much more important position than it has in the sister countries, though there also the experience is that it is a rapidly declining agricultural crop.

In this country, in connection with, and largely as a consequence of, the unusual demand for lint and tow to be consumed in multiform fabrics of house manufacture, sufficient quantities of seed were produced, not only for house use and internal commerce, but to leave a large surplus for foreign export. In an official abstract of the exports from the U. States for the year ending Sept. 30, 1791, Mr Coxe specifies 58,492 casks of flax-seed. This is assumed to be equivalent to 292,460 bushels, — that is, over half the entire product reported for 1860, and a fraction over one sixth of that reported for 1870. Among the exports of the same year were 18,600 pounds of lint, and 6,850 yards of tow cloth; but as the manufacture of cotton fabrics in factories increased, this universal household industry, which had greatly contributed towards keeping families at home, united and contented, by affording a profitable employment to both sexes and all ages, gradually declined to a vanishing point. One consequence was that, while the demand for seed was rapidly increasing, production either remained stationary, or decreased. The cotton famine, consequent upon our civil war, greatly stimulated the cultivation for a few years from 1862 upwards; but since the restoration of the cotton crop, and the return of cotton fabrics to nominal prices, the tide has turned in the States east of the Mississippi, and production of seed and lint is again on the decline. In 1870 the production of fibre returned for the census amounted to 27,133,034 lbs. In the younger States west of the Mississippi, chiefly in Minnesota, Kansas, Iowa, Oregon, and California, the upward tendency in production as yet shows no sign of declining, but seems to grow with accumulating force. Unfortunately flax is grown in this country only for its seeds, and the few manufactures we have must import the fibre from Canada and Europe. Among the obstacles alleged in the way of profitably growing the fibre are the following: 1. The want of a regular and accessible market. 2. The labor involved in pulling flax on a large scale is greater than can be secured at the proper season at wages which will leave any margin for profit. 3. The process of "rotting" or eliminating the fibre from the stalk "in the old-fashioned way" is tedious, and thought to be unhealthy. 4. Most farmers do not sufficiently understand the rotting part of this process, and are therefore very liable to injure the fibre by some failure, either in method or degree. 5. The processes of breaking, scutching, and hackling by hand are very disagreeable, necessarily involving the operator in an atmosphere thick with dust and dirt, and yet requiring skilled workmen, such as it is often quite impracticable to secure. 6. Owing to the cheapness of labor in Europe, it is impracticable to compete with European production without more protection by legislation than is at present granted. The complaint is made that flax-growing has received much less legislative encouragement than either wool or silk. But whatever of weight may be attached to this list of discouragements, they were all to be met and overcome in European production, except that of higher-priced labor, which may be amply counterbalanced in this county by cheaper real estate, both for production and for manufactures, cheaper water-power, fuel, and machinery, and by the use of the new Breaking and Scutching Machines mentioned above, etc.

Rensselaer County, in New York State, which is the seat of linen industry in this country, has 20 mills for dressing flax, and 2 for manufacturing yarn and twine. The latter consumes 3,000 lbs. of fibre daily when running on full time. Much of the fibre used here is imported from Canada and Europe at rates cheaper than American farmers are willing to supply it.

The statement on the following page embodies the latest available returns regarding the acreage and produce of flax in all the countries where the plant is cultivated on account of its fibre.

The Imports of Flax Products into the U. States for the ten years, 1869–1878, were as follows: —

Years.	Raw Flax.		Linens.	Not specified	Flaxseed.		Total value
	Cwt.	*Dollars.*	*Dollars.*	*Dollars.*	*Bushels*	*Dollars.*	*Dollars.*
1878	80,900	1,177,229	11,430,758	2,922,842	1,280,615	1,883,233	17,474,162
1877	89,990	1,243,064	11,509,894	2,406,068	1,445,025	1,916,249	17,075,217
1876	73,180	1,090,437	12,227,893	2,218,110	2,755,725	3,859,496	19,395,979
1875	86,440	1,112,465	14,124,947	2,478,265	3,783,344	6,227,012	23,942,659
1874	68,520	942,038	14,081,428	3,391,327	2,648,321	4,301,680	22,716,483
1873	83,420	1,137,737	16,271,590	4,156,801	2,453,428	3,854,461	25,420,589
1872	105,480	1,309,747	16,615,093	4,695,430	2,936,421	4,318,030	26,938,273
1871	73,440	634,832	13,590,702	4,500,303	....	5,190,647	23,916,474
1870	38,540	605,952	12,716,656	3,547,738	....	4,141,304	21,011,718
1869	39,060	659,411	13,990,341	2,562,546	....	1,543,443	18,765,741

Area under Flax, and Gross Produce of Various Countries.

Countries.	Statute Acres.	Stones per acre.	Tons.
Austria, 178,397 jochs	253,323	21.48	34,009
Belgium, 57,045 hectares	140,901	33.59	29,580
Denmark	17,686	20.00	2,211
Egypt (estimated)	15,000	20.00	1,875
France, 78,774 hectares	194,571	34.84	42,368
Germany, 214,835 hectares	530,642	22.50	74,621
Great Britain	7,481	28.50	1,333
Greece	957	20.00	119
Holland, 19,444 hectares	48,027	31.77	9,536
Hungary, 14,017 jochs	19,903	20.00	2,488
Ireland	123,362	28.74	22,159
Italy, 81,386 hectares	201,023	18.14	22,791
Russia	1,928,568	20.00	241,071
Sweden	37,500	20.00	4,688
Total	3,518,944		488,849

It thus appears that the breadth of lands under flax in Russia alone is little less than four sevenths of the entire acreage devoted to the production of the fibre, and that it alone produces practically one half of the total produce of the world.

Imp. duty: Flax straw, $5 per ton; flax not heckled or dressed, $20; heckled, known as dressed line, $40; tow, $10; brown and bleached linens and other manufactures of flax, or of which flax shall be the component material of chief value, valued at 30 cents or less per sq. yard, 35 per cent; valued above 30 cents per sq. yard, 40 per cent. See Linseed, Linseed Oil, Linen, Yarn, etc.

Flax-Comb, a hatchel or heckle for preparing flax.

Flax-Cotton. Many experiments have been made as to the possibility of preparing and spinning flax in the same way as cotton, and combining it with wool in mixed goods. Chevalier Claussen, a few years ago, hit upon a plan for effecting this. By a particular mode of treatment the fibres can be separated from the boon without steeping; the resinous gum, it is true, is still present; but this does not prevent the fibres from being spun into thick yarns for coarse fabrics, such as sail-cloth, canvas, and cordage. For finer yarns, instead of two or three weeks of steeping or retting, Claussen boiled the flax for six hours in a solution of potash or lime, which not only removed the gum, but left the fibre very smooth and clear. If to be prepared and spun in the manner of cotton, he cut the flax into lengths about equal to those of cotton, exposed them to the action of alkaline and acid solutions, and generated carbonic acid gas, which burst open each little fibre, and separated it into minute filaments. The fibres thus lost the peculiar rigidity which belonged to them originally, and became a soft and downy mass, to which he gave the name of *flax-cotton*, or *cottonized flax*. This flax-cotton can be carded and spun into yarns, which may be used either by themselves or in combination with cotton, wool, or silk. Chevalier Claussen was so sanguine as to believe that flax-cotton could be produced so cheaply as 4½ cts. per lb., and that it would revolutionize the cotton-trade. That flax can in this way be prepared for the spinner in a much shorter time than by retting and the old routine of processes, that it takes a good dye, and that it can be combined in various ways with silk, cotton, and wool, have been clearly proved; but manufacturers have not yet indorsed Claussen's views as to the value of the new material.

Flaxen, made of flax; linen goods. — Resembling, or having the color of, flax.

Flax-Mill, a factory where flax is spun into linen goods.

Flaxseed. See Linseed.

Flax-Silk, a stuff made of flax and silk, and having the glossiness of silk.

Flax-Thread, twisted flax-yarn.

Flax-Yarn. See Yarn.

Flay, to strip or cut off the skin.

Fleabane, a name given to various plants of the genus *Erigeron*, from their supposed efficacy in driving away flies.

Fleak, a twist or lock; a hurdle or grating.

Fleam, a large strong instrument, used by veterinary surgeons, for letting blood from horses and other animals.

Flecked, mottled, dappled, spotted.

Fleece, as much wool as is shorn from one sheep; the weight varies according to the breed and the climate. — See Wool.

Fleet, a navy; a collection of ships or sailing boats. — An inlet or creek. — Swift; shallow.

Fleet-Dyke, an embankment for preventing inundation.

Fleeting-Dish, a skimming-bowl.

Flemish-Bricks, paving bricks of a yellowish color, harder than the ordinary bricks.

Flemish-Horse, in marine parlance, an additional foot-rope at the ends of topsail yards.

Flench, Flinch, to strip off in layers.

Flench-Gut, the blubber of a whale laid out in long slices in the hold before barrelling.

Flensing, the operation of cutting the blubber from the whale.

Flesh, butcher's meat; the carcass of any animal killed for food.

Flesh-Brush, a brush for rubbing the surface of the body, of which there are several kinds, made either of horse-hair or fine wire, etc.

Flesh-Color, the color of the flesh; white with a blush of pink.

Flesh-Fork, a cook's fork for trying meat, and taking it from the boiler.

Flesh-Hook, a hook to hang meat.

Fleshing-Knife, a convex knife, with a sharp

edge, used by curriers in removing the flesh and fat from the inner surface of the hide.

Fletador [Sp.], the freighter of a ship.

Fleurage [Fr.], oatmeal or bean-meal for gruel.

Fleuret [Fr.], a sort of coarse silk; a kind of narrow ribbon; ferret-ribbon. — An instrument to practise fencing with.

Fleury. See Burgundy Wines.

Flies, artificial insects, which are dexterously made of bright feathers, silk, etc., for the use of anglers for fish in rivers and lakes.

Flight, a series of steps or stairs from one floor to another without turning.

Flighter, a cooler's horizontal vane, revolving over the surface of wort, to produce a circular current in the liquor.

Flimsy, a loosely woven fabric, wanting in firmness of texture. — A name among reporters for manifold copies of articles of news written on tissue-paper.

Flinking-Comb, a dressing-table comb for the hair.

Flint [Fr. *pierre à fusil;* Ger. *Feuerstein*], a mineral composed almost entirely of silica. Few parts of the world are without it. Among its useful applications, two are gradually becoming obsolete. The flint used with the steel and the tinder-box is yielding to the lucifer-match; while the flint of the gunlock, in pistols and muskets, is almost superseded by the percussion-cap. The present use of flint, in its native state, is chiefly in making glass and earthenware.

Flint and Père Marquette R.R. runs from Monroe to Luddington, Mich., a distance of 253.31 m., with branches from Bay City to East Saginaw, 12.35 m., and from Flint to Otter Lake, 14.41 m.; total length of line, 280.07 m. This Co., whose offices are in East Saginaw, Mich., was organized in 1857, and in 1872 it was consolidated with the Bay City and East Saginaw, the Holly, Wayne, and Monroe, and the Cass River and Flint River R.R. Co. The road was opened in 1874. The Co. has secured a land grant of 3,840 acres per mile of road, and these have been divided into several trusts to secure an equal number of mortgages on the road and lands. *Financial statement:* Cap. stock, $3,298,-300; funded debt, $7,157,905.50, as follows, — 1st mortgage L. G. bonds, 1st series, $1,000, payable 1880, interest 7 % (May and Nov.); 1st mortgage L. G. bonds, 2d series, $9,000, payable 1887, interest 7 % (Jan. and July); 1st mortgage L. G. bonds, 3d series, $1,997,000, payable 1888, interest 8 % (Mar. and Sept.); F. and H. lease bonds ($25,000 per ann.) $375,500, payable 1888, interest 10 % (May and Nov.); B. C. & E. Saginaw R.R. bonds guaranteed $100,000, payable 1882, interest 10 % (Jan. and July); Bay Co. bonds (loan to same) $75,000, payable 1887, interest 10 % (Mar. and Sept.); Holly, Wayne, & Monroe R.R. bonds $1,000,000, payable in 1901, interest 8 % (Jan. and July); Construction Loan Bonds, $41,405.50, payable 1878, interest 8 % (Jan. and July); Consolidated Sinking Fund, $3,-559,000, payable 1902, interest 8 % (May and Nov.).

Flint-Glass. See Glass.

Flintlock, the old-fashioned musket-lock, with a flint fixed in the hammer, for striking on the steel pan.

Flint-Powder, pulverized flint used in manufactures as a polishing material.

Flitch, in the pork-trade, the side of a hog salted and cured.

Flittern-Bark, the bark of young oak-trees, as distinguished from that of old oak-trees, which is called timber-bark, and is less valuable to tanners. There is a third sort called coppice-bark, which is the bark stripped off oak grown as coppice from stems or stools.

Float, the water-gauge of a steam-boiler, attached to a valve in the feed-pipe, and supported upon the surface of the water by a counter-weight (see F, Fig. 37). — The buoy of a fishing-line, whose motion indicates the bite of a fish. — An inflated bag or pillow to sustain a person in the water. — A raft of timber 18 feet square by 1 foot deep. — A plasterer's trowel, of which there are several kinds, used in spreading the plaster on to a wall. — A file whose teeth are parallel and unbroken by a second row of crossing teeth. — A serrated plate used by shoemakers for rasping off the pegs inside the boot or shoe.

Float-Board, one of the boards fixed on the paddle-wheels of steamers, and to undershot water-wheels, by which they act.

Floating-Bridge, a flat-bottomed ferry steam-boat in a harbor or river, running on chains laid across the bottom, and constructed for the conveyance of passengers, goods, and vehicles.

Floating-Light, a life-buoy carried at a ship's stern, with a light or lantern, which can be dropped into the sea, in order to save any one falling overboard at night. — Also a light attached to a boat or the hull of a vessel moored over a rock or a shoal to serve the purpose of warning to mariners.

Floating-Pier, a landing stage that rises and falls with the tide.

Floatsam. See Flotsam.

Flock, an indefinite number of sheep, kept together under one shepherd. — The short refuse of a wool-factory, which being scoured, pulverized in a mill, and dyed, is used to make flock-paper. — The refuse or waste of wool and cotton, which is cut to a very short staple by machinery, and used for stuffing upholstery, mattresses, etc.

Flock-Paper, wall-hangings in which finely pulverized and dyed wool is laid on the surface of paper and attached by size.

Flogging-Chisel, a chisel of large size, used in chipping off certain portions of a casting.

Flood-Gate, a sluice in rivers, canals, or docks, that may be opened or closed at will, to admit or exclude water.

Flood-Tide, the advancing tide increasing towards high water.

Flookan, earth or clay of a slimy consistence. — In mining, the shifting of the vein or lode by a cleft, etc.

Floor, the timber, bricks, etc., of the platform which forms the base or surface of any story of a house, and on which the planks or flooring are laid. The name in a general sense applies to all that part of a building on the same level, and varies according to the height from the ground, as first floor, second floor, etc. — The bottom of a vessel on each side of the kelson.

Floor-Cloth, Oil-Cloth, a heavy painted fabric for covering floors. This useful and ornamental fabric, which now forms an important branch of American manufacture, originated in Great Britain, about the year 1740, when a manufactory of it was established at Knightsbridge, near London, by Mr. Smith. It was originally made of narrow canvas sewn together like sail-cloth, to which successive coats of paint were applied; but the seams proving inconvenient, a canvas was wove for the purpose, about four yards wide; it was then extended to seven yards in width, and afterwards to nine, which is the widest at present made. The manufactory at Knightsbridge, now carried on by Mr. Baber, is the largest establishment of the kind, — the com-

mon dimensions of the oil cloths produced there being 20 yards by 8, and 30 yards by 7, giving, therefore, entire pieces of 160 and 210 square yards without seams.

Manuf. The canvas is first cut into pieces of the required length and breadth, and the edges are fastened to the four sides of a large frame, which are then drawn apart by machinery, to stretch the canvas as tightly as possible, somewhat in the manner adopted in straining canvas for Berlin-wool work. The position of the frame is vertical, the height being equal to the width of the canvas; when this exceeds 6 or 8 feet, the upper part is reached by means of light scaffolds or stages, which the workmen can move from one end of the piece to the other throughout the entire length, whenever occasion may require it during the process of painting. The canvas is then in a proper condition for the reception of the size and paint, which is laid on to render it fit to undergo the final process of printing. It is first coated with strong size on both sides, and while this is still damp the canvas is rubbed all over with pumice-stone, to render it smooth and even. When the size is dry, the canvas receives two coats of paint on each side. The first coat is very thick, being more like mortar than paint; it is laid on in lumps and patches, and smoothed all over the web with a broad flat trowel, in a manner resembling that in which plaster is laid on a wall. When this is thoroughly dry, the surface is again rubbed with pumice-stone, and a second coat of thinner paint is laid on with a brush. The under side of the canvas requires nothing more to be done to it after this, but the upper side receives two or three more coats of thin paint, being rubbed with pumice-stone after each coat has been laid on, in order to produce a smooth surface to receive the printed pattern. The canvas is now removed from the frame and wound round a roller, from which it is allowed to pass over a flat table, to receive the impression of the blocks. Formerly the patterns were stencilled, as the walls of rooms were before paper-hangings were introduced; that is to say, they were produced by putting coloring matter on the surface, through holes and lines punched in a sheet of tin or pasteboard, so as to form the design required; but now the printing is effected by blocks, a separate block being required for every color introduced into the pattern. The blocks are about 15 inches square, and are made of deal, faced with wood of a fine close grain, with a handle at the back; that part of the pattern which each block is required to imprint on the canvas is left on its surface in relief, the remaining part being cut away, as in a wood-engraving. The surface of the projecting portion of each block is further cut into small squares, technically called teeth, by narrow grooves crossing each other at right angles. This is done to effect an equal distribution of the paint, for if the surface of the projecting part of the blocks were left smooth and even, it would take up the coloring matter unevenly, and transfer it to the floor-cloth in irregular patches. The impression is effected by applying the surface of the block to a pad or cushion charged with the color required; after which it is transferred to the floor-cloth by means of the handle at the back, and pressed forcibly upon it. It is then removed, charged again with color, and pressed on the canvas close by the side of the first impression, points being placed at the corners of the blocks to insure the regularity of the joining of the pattern. This process is repeated until the whole of the floor-cloth has been covered with that part of the pattern which is imprinted by the first block that is used, after which the blocks intended to convey the remaining colors to its surface are used in a similar manner, until the pattern is complete. It must then be allowed to dry, care being taken to give the coloring matter sufficient time to harden thoroughly before the floor-cloth is taken into use. The borders along the sides of narrow pieces of floor-cloth intended for passages are produced in the same manner, by blocks of the necessary width, similarly prepared for the purpose. It should be stated that worn-out Brussels carpets afford a good foundation for floor-cloth, and may be converted into that material at any floor-cloth manufactory. — A cheap kind of floor-cloth for the protection of carpets and stair carpets, somewhat similar to oil-baize, or oil cloth for table-covers, is made on a foundation of thin calico, and thinly coated with paint on one side only, after which the pattern is imprinted in the usual way, or by rollers. — *Kamptulicon* is a substance intended to present certain advantages over painted canvas as a floor-covering. It is made of cork reduced to a fine powder, india-rubber, linseed-oil, and one or two other substances. These ingredients are kneaded up into a kind of dough, which is pressed out into sheets by rolling with steam-heated cylinders. When cold, these sheets may at once be used as a floor-covering, or may be painted with any ornamental device. It forms a more noiseless, elastic, and dry floor-covering than the common one.

Imp. duty: Oil-cloths for floor, stamped, painted, or printed, valued at 50 cts. or less by sq. yd., 35 per cent, valued over 50 cts. per sq. yd., 45 per cent. For carriage-floors, too thin and frail for recognized floor oil-cloths, 45 per cent.

Floor-cloth Canvas, a coarse fabric of mixed hemp and flax, varying in width from one to eight yards or more.

Flooring, in carpentry, the laying down of boards close together horizontally, with some kind of timber support underneath to which the boards can be nailed.

Floran, a mining term for fine-grained tin, either scarcely perceptible in the stone, or stamped very small.

Floree, powder blue or indigo.

Florence Leaf. See DUTCH LEAF.

Florence-Oil, olive-oil sold in peculiar flasks known as Florence flasks.

Florentine, a kind of wrought satin made in Florence. — A lake color extracted from the shreds of scarlet cloth.

Flores, a commercial classification of indigo, the best quality of dye from Nos. 7 to 9.

Floretonne, a Spanish wool.

Floretta, refuse of floss-silk.

Florida, the most southern of the U. States, is a large promontory extending S. into the Atlantic Ocean, its S. and W. coasts forming in part the N. and E. shore line of the Gulf of Mexico. Its boundaries are comprised between 24° 30′ and 31° N. lat., and 80° and 87° 45′ W. lon. *F.* makes the S. boundary of the State of Georgia, and in part that of Alabama, from which it is separated on the N. W. by the river Perdido. The Atlantic washes its E. and the Gulf of Mexico its S. and W. coasts, constituting a seaboard of 1,146 m. On the S.-E. it is separated from the Bahamas by the Straits of Florida. It points toward Cuba on the S., Havana being about 110 m. from Key West. Its entire length from Perdido River to Cape Sable is about 700 m., its mean breadth, 90 m. Area, 59,268 sq. m., or 37,931,520 acres, of which 2,373,541 acres were in 1870 included in farms. Population about 200,000. Besides its seaports (given below), the principal cities of *F.* are Jacksonville, on the St. John's River, a flourishing city much resorted to by invalids from the Northern States on account of the salubrity of its climate (pop. 15,000); Tallahassee, the capital (pop. 2,500); and St. Augustine (pop. 2,000). — The peninsula proper terminates on the S. in Cape Sable; but a remarkable chain of rocky islets, called the *F. Keys*, begins at Cape *F.* on the E. shore, extends S.-W. nearly 200 m. in a direction generally conforming with that of the coast, and ends in the cluster of sand-heaped rocks known as the *Tortugas*, from the great number of turtle formerly frequenting them. S. of the bank on which these Keys rise, and separated from them by a navigable channel, is the long, narrow, and dangerous coral ridge known as the *F. Reef*. This group of keys and reefs is washed on the S. by the constant current of the Gulf Stream. The most important of the Keys is Key West (which see below). The Gulf coast of the State is intersected by numerous bays, among which are Pensacola, Choctawhatchee, St. Andrew's, Appalachicola, Appalachee, Tampa, Charlotte, Ponce de Leon or Chatham, and *F.* Bays, the last lying between the Keys and mainland. The chief rivers are St. John's, navigable about 100 m. for vessels of moderate draught, and emptying into the Atlantic after a northerly course of 300 m.; Indian River, a long narrow lagoon on the E. coast, which it is proposed to unite by a canal with the St. John's; the Suwanee and Ocklokonee, which rise in Georgia and flow into the Gulf of Mexico; the Appalachicola, formed by the Chattahoochee and Flint Rivers, and emptying into the bay of the same name; Choctawhatchee, Escambia, and Perdido, also flowing into the Gulf. The St. Mary's makes for some distance the N. boundary of the State.

F. has also numerous lakes, some of which are navigable. Lake Okeechobee, in the Everglades, is about 40 m. long and 30 broad. — The surface of *F.* is generally level, the greatest elevation being not more than 300 feet above the sea. The most remarkable feature is the immense tract of marsh filled with islands in the S. part of the state, called the Everglades, and by the Indians, "grass-water." Between the Suwanee and Chattahoochee the country is hilly; the western portion of the State is level. De Bow designates the lands as high-hummock, low-hummock, swamp, savanna, and pine. The soil is generally sandy, except in the hummocks, where it is intermixed with clay. These hummocks vary in extent from a few to thousands of acres, and are found in all parts of the State. They are usually covered with a heavy growth of red, live, and water oak, magnolia, pine, and dogwood. When cleared they afford desirable openings for cultivation. The savannas are rich alluvions on the margins of streams or lying in detached tracts, yielding largely, but requiring ditching and dyking in ordinary seasons. In the "barrens," as the pine forests are called, the soil is very poor, and thickly overgrown with pine and cypress. The district comprised in the Everglades is impassable during the rainy season from July to October. It is about 60 m. long by 60 broad, covering most of the territory S. of Lake Okeechobee, or Big-water. The islands with which this vast swamp or lake is studded vary from one fourth of an acre to hundreds of acres in extent. They are generally covered with dense thickets of shrubbery or vines, occasionally with lofty pines and palmettos. The water is from 1 to 6 feet deep, the bottom being covered with a growth of rank grass. The vegetable deposit of the Everglades is considered well adapted to the cultivation of the banana and plantain. Another remarkable feature of *F.* is the subterranean streams which undermine the rotten limestone formation, creating numerous cavities in the ground called "sinks." These are inverted conical hollows, or tunnels, varying in extent from a few yards to several acres, at the bottom of which running water often appears. A most remarkable spring, situated 12 m. from Tallahassee, has been sounded with 250 fathoms of line before finding bottom. The outflow forms a beautiful lake, transparent and cold as ice even in the hottest weather. The great sink of Alachua County is a subterranean passage by which the waters of the Alachua savanna are supposed to discharge themselves into Orange Lake. In fact, the geological structure of the State is remarkable, much of its surface seeming a crust through the openings of which underground lakes and rivers force their way. — *Climate. F.*, except in the vicinity of the swamps, possesses one of the most equable and agreeable climates of the continent. Occupying as it does a situation between the temperate and tropical regions, it enjoys exemption from the frosts and sudden changes of the one and the excessive heat of the other. The mercury, however, sometimes falls to the freezing-point, and great damage is done to the orange plantations. The winter climate of the Gulf coast is more rigorous than that of the Atlantic. The seasons partake of the tropical character, winter being distinguishable by copious rains. Statistics show the State to be one of the healthiest, if not the healthiest, of the U. States, and its resident population is largely increased in the winter months by invalids from the North, seeking a more genial clime. Jacksonville, St. Augustine, and Key West are preferred by this class of visitors, who are every year becoming more numerous. The mean winter temperature as observed at Key West was slightly less than that of Havana; while for the months from July to November it was about the same. Besides the advantage of its climate, the semi-tropical character of *F.* offers a grateful and striking change of scene to the health-seeker, who leaves the frozen streams of New England for a country teeming with luxuriant vegetation and strewn with flowers. — *Products.* The productions of *F.* are of an essentially tropical character; cotton, tobacco, rice, sugar-cane, arrow-root, hemp, flax, coffee, and the cocoanut flourish there. The climate is also favorable to the cultivation of the silk-worm and for the cochineal insect. Oranges, bananas, lemons, limes, olives, grapes, pineapples, grow abundantly, and are of exquisite flavor. Indian corn, sweet potatoes, beans, peas, and such products of a more northern climate as Irish potatoes, barley, buckwheat, hops, etc., are also raised. The cultivation and export of oranges and other fruits have grown to be a considerable source of wealth to the State; and the manufacture of cigars, especially at Key West, is becoming an important industry. The pasturage afforded by the savannas is excellent, cattle requiring little or no attention from their owners, and no housing in winter. Game and fish abound in every part of the State. Deer, wild turkeys, partridges, geese, ducks, and other small game are in all the forests and about all the lakes, rivers, and swamps; green turtle, oysters, sheep's-head, red fish, mullet, etc., are found on all the coasts, and fresh-water fish in all the inland waters. Magnificent sponges are gathered along the reefs, and form a considerable item of trade. Cotton, rice, sugar, tobacco, lumber, fish, and fruits may be considered the most valuable products. *F.* cotton is grown almost exclusively in the northern group of counties, but the State is capable of producing the celebrated sea-island variety, the cultivation of which was formerly confined to a few islands on the coasts of South Carolina and Georgia. Appalachicola, formerly a considerable shipping port for cotton, has been superseded by Fernandina on the Atlantic. The crop of 1877 is reported at 34,303 bales, of which 11,214 was sea-island; but it should be stated that this computation includes only shipments from *F.* outports, there being no data whence to estimate accurately the quantity going to ports out of the State by rail. The wool grown in *F.* is long stapled, of medium and coarse grades, little attention being as yet given to producing fine wools. In 1878 the flocks had increased to 56,500 head, yielding 200,000 lbs. of wool. East and South *F.* rely mainly upon fruit-culture. *F.* is said to be the only section of the Union where the orange can be grown to any extent with success. There is no fear of winter-killing S. of Pilatka. The quality of the fruit and the excellent condition in which it reaches the northern markets render this a most profitable crop. The forests of *F.* form no inconsiderable source of wealth. The live-oak, so valuable in ship-building,

Fig. 195. — Seal of Florida.

abounds, also the other varieties of oak, swamp cypress, hickory, pine, magnolia, dogwood, and laurel. The *Palma Christi* (castor-oil bean) becomes here a large tree; on the islands and keys boxwood, satinwood, mastic, and lignum-vitæ grow abundantly. The pine is found from Cape Sable to near Indian River. In addition to fruit-bearing species, the pimento, coffee, pepper, clove, and other spice-trees and shrubs may be successfully cultivated. In 1878 the value of the live stock on farms was $8,341,310. The number of horses was 22,200; mules and asses, 11,800; milch cows, 70,700; oxen and other cattle, 508,700; sheep, 56,500; swine, 190,000. — *Manufactures.* These are unimportant, and are chiefly confined to flour and grist mills, lumber-mills, and establishments for the manufacture of sugar and molasses. Agriculture and commerce are the chief resources of the State, — the export of its fibrous products, cereals, fruits, fish, live-oak and other timber, giving employment to a considerable tonnage. Among the mineral productions may be named amethyst, turquoise, lapis-lazuli, ochre, coal, and iron ore.

Trade. — The coasting-trade employs many steamers and sailing craft, plying chiefly between Florida ports and Savannah, Baltimore, Philadelphia, and New York. Pensacola and Appalachicola are naturally points of shipment for Southern Alabama and Southwestern Georgia. The bulk of foreign merchandise reaches the State from northern ports instead of by direct importation. Key West shows much the largest tonnage of vessels entering or clearing, St. John's and Fernandina following in the order named. Ship-building is carried on at all the ports, the vessels usually being of small burthen, for coast traffic. — *Railways.* In 1878 there were only 484 m. of railway in *F.* The Jacksonville, Pensacola, and Mobile Railroad extends west from Jacksonville to Chattahoochee, and is the longest in the State. Lateral lines connect this line with the Georgia system by a branch from Live Oak due N. to Dupont, and with St. Mark's on the Gulf by a branch S. from Tallahassee. The Atlantic, Gulf, and West India Transit Company's line extends from Fernandina on the Atlantic to Cedar Keys on the Gulf, distance 155 m. The Pensacola and Louisville road extends from Pensacola N. to a junction with the Mobile and Montgomery (Alabama) Railroad, 45 m. The St. John's River line crosses from St. Augustine to Tocoi on the St. John's, 14 m. — *Seaports.* Notwithstanding the great extent of its seacoast, *F.* has few good harbors. Besides Key West, Pensacola, and Fernandina (separately given below), the principal ports are Appalachicola, St. Mark's, Cedar Keys, Tampa, and Charlotte on the Gulf, and St. Augustine on the Atlantic coast.

Fernandina, the cap. of Nassau Co., is situated on Amelia River and Amelia Island, about 185 m. E. by N. of Tallahassee. Its harbor is perfectly secure, and can receive the largest vessels. It is the eastern terminus of the Gulf Railroad, and its port has 12 vessels, with an aggregate tonnage of 2,185. In 1878, 139 vessels (tonnage, 89,697) entered, and 162 (tonnage, 92,750) cleared, the port. During the same year the imports amounted to $22,778, while the exports (naval stores, lumber, etc.) amounted to $268,143. Pop. about 3,000.

Key West is built on an island of the same name, 60 m. S. W. of Cape Sable, lat. 24° 32′ N., and lon. 81° 52′ W. The island, which is only about 4 m. long and 1 m. broad, was long the haunt of smugglers and pirates, but is now a busy and thriving place, and one of the most important naval stations possessed by the U. States, on account of its commanding situation at the entrance of Florida Pass, the most frequented passage into the Gulf of Mexico, as well as its nearness to Havana, Kingston, and other important ports of the West Indies. The banks and reefs in the vicinity rendering the navigation difficult and dangerous, the U. States government has established at this place a fleet of 15 vessels, with crews of about 10 men each, for rendering assistance to vessels in distress. Key West is also the seat of an admiralty court for

Fig. 196. — Key West.

the adjudication of claims for salvage. It has an excellent harbor, with about 25 feet water, and possesses 142 vessels (tonnage, 6,190). In 1878, 188 vessels (tonnage, 194,970) entered, and 175 (tonnage, 194,059) cleared, the port. During the same year the imports (mostly tobacco leaf) amounted to $674,593, and the exports (chiefly horned cattle, wheat flour, Indian corn, and bacon) were valued at $627,837. Pop. about 5,000.

Pensacola, the cap. of Escambia Co., is on the W. shore of Pensacola Bay, about 180 m. of Tallahassee. Its harbor, with 21 feet of water on the bar, is one of the best in the Gulf of Mexico. The government has here a naval station and a marine hospital. The port has 104 vessels, with an aggregate tonnage of 10,189. Pensacola is the centre of trade for the whole area of territory embraced by Santa Rosa Sound, Choctawhatchee Bay and River, and the Escambia, Black Water, and Perdido Rivers, — a territory reaching on the N. and W. far into the State of Alabama. For the year 1878 there entered and cleared from the port 490 vessels, with a total tonnage of 261,037. The imports amounted to $22,407. The exports, consisting of hewn, sawn, dressed, and undressed timber, oak, cedar, staves, barrels of rosin, cotton, flour, cotton seed, sticks of fustic, etc., reached $2,063,512. Pensacola has also an important coastwise trade with Baltimore, New York, and other U. States ports. Pop. about 3,000.

Floriline, a vegetable tooth-paste, consisting of a red, dry, rather hard mass, made from prepared chalk, 20 grammes; starch powder, 10 grammes; glycerine, 8 grammes; pellitory tincture, 3 grammes; peppermint-oil, 10 drops; and water, q. s., colored with Florentine lac.

Florin, a silver coin current in several countries of Europe, ranging in value from 40 to 50 cents

The English florin, first minted in 1849, and of which sixteen million pieces have been since put into circulation, is worth 2*s*., and was the first practical attempt at a decimal currency in Great Britain.

Florist, a dealer in flowers; one who grows and sells them.

Floss, fluid glass floating in a puddling-furnace.

Floss-Silk [Fr. *bourre de soie, filoselle*] is the name given to the portions of ravelled silk broken off in the filature of the cocoons, which is carded like cotton or wool, and spun into a soft coarse yarn or thread, for making bands, shawls, socks, and other common silk fabrics. The floss or fleuret, as first obtained, must be steeped in water, and then subjected to pressure, in order to extract the gummy matter, which renders it too harsh and short for the spinning-wheel. After being dried it is made still more pliant by working a little oil into it with the hands. It is now ready to be submitted to the carding-engine. It is spun upon the flax-wheel. Pretty fine fabrics of this material are now produced in Italy, France, and England. *Imp.* duty, 35 per cent.

Flotilla, a fleet, how large soever, composed of small vessels.

Flotsam, Jetsam, and Ligan. In order to constitute a legal wreck, the goods must come to land. If they continue at sea, the law distinguishes them by the foregoing uncouth and barbarous appellations: *flotsam* is when the goods continue swimming on the surface of the waves; *jetsam* is when they are sunk under the surface of the water; and *lagan* is when they are sunk, but tied to a cork or buoy to be found again. All three belong to the government, or its grantee, if no owner appear to claim within a year after they are taken possession of by the persons otherwise entitled to them.

Flounce, a loose appendage or trimming to the skirt or lower part of a lady's dress.

Flounder, a flat fish, the *Pleuronectes flesus*, common on our eastern coasts. Its flesh is very wholesome. — In shoemaking, a slicking-tool whose edge is used to stretch leather for a boot-front in a blocking-board.

Flour [Dutch, *bloem*; Fr. *fleur de farine*; Ger. *Feines Mehl, Semmelmehl*; It. *fiore*; Port. *flor da farinha*; Sp. *flor*] is the grain of wheat reduced to powder and separated from the outer husk or covering in which the seed is enveloped. The name is also applied to the grain of other cereals, and to the farinaceous seed of pulses similarly treated, and it is used generally to indicate any finely powdered dry substance; but when the term is employed without any qualification, it invariably means flour of WHEAT, under which name are given the commercial statistics of flour.

Flour-Barrel, a light cask made to hold flour, of which millions are made annually. So immense is the quantity of hoops wanted for making these barrels, that, besides those produced in the country, they are largely imported from Canada, chiefly through the port of Rochester. — The American barrel of flour weighs 196 lbs.

Flour-Dredge, a tin for sprinkling flour.

Flour-Dresser, a cylinder for dressing flour, instead of passing it through bolting-cloths.

Flour-Mill. The ordinary *F.-M.* of the present day is a structure of comparatively few essential parts; but in the arrangement and mounting of these the greatest amount of mechanical skill and experience has been exercised, and the accessories of the mill have been elaborated with much care, with the view of saving manual labor and perfecting the processes and results. Fully to appreciate the various processes of modern milling, it is necessary to bear in mind, not only that the wheat as delivered at the mill is dusty and mixed with sand and other refuse, but that it contains many light grains and seeds of foreign substances, which might be deleterious, and would certainly interfere with the appearance of the finished flour. Again, the structure of the wheat-grain itself must not be overlooked. A grain of wheat is not a seed, but a fruit, consisting of a pericarp, or outer envelope, tightly adherent to its contained single seed. The envelope consists of several layers of ligneous tissue, within which are the embryo and a peculiar fermentive nitrogeneous principle termed cerealin, and finally a central mass of thin cells filled with a white powdery substance largely composed of starch granules. The object of ordinary milling is to grind as perfectly as possible, without breaking the minute granules, the central substance of the grain, and to separate it from the embryo and outer husks, the former constituting the flour and the latter the bran of the miller. Whole wheaten flour, on the other hand, consists of the entire grain ground up to a uniform mass. The machines and processes by which flour is prepared are very numerous, and are diverse in character; and it must further be said that, at the present moment, the whole industry is in a peculiarly unsettled and transitory state. The system which has prevailed in the U. States hitherto is what is known as ordinary or flat grinding with millstones; but in the mean time a strong tendency is developing in favor of the use, either partially or entirely, of granulating or *high milling*, and of some of the various systems of roller grinding which have been introduced. In Hungary and Austria the system of high milling prevails, in which the action of the millstones consists more in granulating than grinding; and in connection with that system of milling the use of rollers is a prominent feature. To a limited extent also the principle of the disintegrator has been brought into operation, in which the grain is broken by the violent impact of studs or projections revolving in opposite directions with enormous velocity. Thus we have these various systems: (1) flat milling or grinding; (2) high milling or granulation; (3) roller milling or crushing; and (4) disintegrator milling or breaking.

Flat or Ordinary Milling. In the ordinary or flat millstone milling there are three main points to consider: (1) The cleaning and preparation of the wheat: (2) the grinding; and (3) the bolting or dressing of the ground products. The ordinary cleaning or screening apparatus through which the wheat, as received, passes, consists of a kind of cylindrical sieve of wire cloth, mounted in a sloping position, and having internal partitions so as to resemble an Archimedean screw. When the apparatus is set in motion, the grain, fed in at its upper end, tumbles from one division into another, thereby being freed from small refuse and sand, and as it issues at the lower extremity is subjected to a fan blast. For cleaning grain there are other kinds of apparatus, in which the principle of aspiration, or drawing currents of air through the grain, is now extensively employed, the most frequently used being Child's aspirator. A further cleaning is sometimes given by Child's decorticator, an implement which can be adjusted at will, for simply rubbing and scouring the grain, or for removing the thin bran and germ previous to the operation of grinding. The "Victor" brush-machine is a recently introduced and highly approved apparatus for polishing wheat, its peculiar feature being that the opposed brushes are constructed and worked in such a manner that they come in contact with every kernel of wheat in every conceivable position, and with as much force as the miller chooses to use, thus polishing it on the end better than any other machine can do, and this not only on one pair of brushes, but on several. The prepared grain is next conveyed to the grinding apparatus, and here it may be said that, in moving the grain or flour horizontally, Archimedean screws working within an inclosed casing are employed, while in lifting from one floor to another, small boxes mounted on an endless band worked over pulleys and

similarly encased are used. The grinding machinery consists, first, of a bin containing the grain to be ground, from which it passes by a spout to the hopper, whence it is delivered by a feeding adjustment to the stones. These constitute the distinctive feature of the entire mill, and upon their condition and delicate adjustment the whole success of the milling operation turns. They consist of two flat cylindrical masses enclosed within a wooden or sheet-metal case, the lower or *bed-stone* being permanently fixed, while the upper or *runner* is accurately pivoted and balanced over it. The average size of millstones is about 4 feet 2 inches in diameter by 12 inches in thickness, and they are made of a hard but cellular silicious stone called buhr-stone, the best qualities of which are obtained from La Ferte-sous-Jouarre, Department of Seine-et-Marne, France. Millstones are generally built up of segments, bound together around the circumference by an iron hoop, and backed with plaster of Paris. The bedstone is dressed to a perfectly flat plane surface, and a series of grooves or shallow depressions are cut in it. The grooves on both are made to correspond exactly, so that when the one is rotated over the other the sharp edges of the grooves, meeting each other, operate like a rough pair of scissors, and thus the effect of the stones on grain submitted to their action is at once that of cutting, squeezing, and crushing. The dressing and grooving of millstones is generally done by hand-picking, but sometimes black amorphous diamonds (carbonado) are used, and emery-wheel dressers have likewise been suggested. The upper stone, or runner, is set in motion by a spindle on which it is mounted, which passes up through the centre of the bedstone, and there are screws and other appliances for adjusting and balancing the stone. Further, provision is made within the stone case for passing through air to prevent too high a heat being developed in the grinding operation; and sweepers for conveying the flour to the meal spout are also provided. The ground meal delivered by the spout is carried forward in a conveyer or creeper-box, by means of an Archimedean screw, to the elevators, by which it is lifted to an upper floor, to the bolting or flour-dressing machine. The form in which this apparatus was formerly employed consisted of a cylinder mounted on an inclined plane, and covered externally with wire cloth of different degrees of fineness, the finest being at the upper part of the cylinder, where the meal is admitted. Within the cylinder, which was stationary, a circular brush revolved, by which the meal was pressed against the wire cloth, and at the same time carried gradually towards the lower extremity, sifting out as it proceeded the mill products into different grades of fineness, and finally delivering the coarse bran at the extremity of the cylinder. For the operation of bolting or dressing, hexagonal or octagonal cylinders, about 3 feet in diameter and from 20 to 25 feet long are now commonly employed. These are mounted horizontally on a spindle for revolving, and externally they are covered with silk of different degrees of fineness, whence they are called *silks*, or *silk-dressers*. Radiating arms or other devices for carrying the meal gradually forward as the apparatus revolves are fixed within the cylinders, and there is also an arrangement of beaters which gives the segments of cloth a sharp tap, and thereby facilitates the sifting action of the apparatus. Like all other mill machines, the modifications of the silk dresser are numerous. Mill products are differently assorted and classified in various localities and different mills, — some distinguishing many qualities of flour and bran, and others making only three or four divisions. (See WHEAT.) The following (from Church's *Food*) may be taken as a fair average representation of the product of 100 lbs. of good white wheat: —

Flour	1	Finest flour	42 lbs.
	2	Seconds flour	18 "
	3	Biscuit flour	9 "
	4	Tails, or tailings	3 "
Middlings	5	Middlings, or fine sharps	8 "
Bran	6	Coarse sharps	3 "
	7	Fine pollard	3 "
	8	Coarse pollard	6 "
	9	Long bran	3 "
		Loss by evaporation, etc.	5 "

An additional proportion of fine flour is obtained by dressing and remilling tailings and middlings, and the purification and regrinding of these products have now become of much consequence in connection with the changed systems of milling rapidly coming into use. A great variety of middlings purifying machines have been introduced and eagerly pushed within the last few years, showing that this branch of economic milling is now receiving great attention.

The Hungarian System, or High Milling. The object of the low or flat milling process is to produce at one grinding operation as large a proportion of good finished flour as possible. In high milling, on the other hand, the stones are kept so far apart that grain is merely bruised in the first operation, and by a series of such grindings or bruisings, alternated with elaborate sifting, the bran and all the outer envelopes with the cerealin are detached, and a nucleus of very pure semolina only left. In this way a large proportion of very inferior branny flour is obtained in these early millings, and the proportion of exceedingly fine strong flour for which Austro-Hungarian millers are famous is comparatively small. It is only to the hard brittle wheats that the Hungarian system of milling is applicable, and the method is only practicable under circumstances where there is a demand for the two extreme qualities of mill product which result from the system. Within the last few years the Hungarian millers have very largely adopted the roller mills, either to supplant entirely or to supplement stone grinding.

Roller Mills. In this form of mill a pair of horizontal rollers rotate face to face, and the grain or other material is submitted to their action by passing between them. The nature of that action varies according to the modification of roller surfaces, the closeness of the rollers to each other, and the equal or differential rate at which they revolve. Rollers of metal, either steel or chilled iron, having a toothed surface, revolving at different rates of speed and at definite distances apart, have a cutting action on the grain submitted to them. Such rollers are employed in the Buchholz system for reducing hulled wheat to the condition of semolina, and a similar arrangement is employed in the machine of Ganz & Co., of Buda-Pesth. Fig. 197 shows a section of the face of a pair of such rollers, where B, revolving slowly, serves as a holder for the grain, which is cut by the sharp edges of A, revolving at a speed three times greater than B. Smooth surface rollers are mounted to press hard against each other, and are made in some cases of polished chilled metal; and in other instances cylinders of porcelain are employed. Their principal function is for the reduction of purified middlings and semolina, and when no differential motion is given the action is simply that of squeezing; but when the opposing rollers revolve at different rates of speed a grinding effect is further superadded. A roller mill which has met great and sudden public acceptance is that invented and patented by F. Wegmann, a miller of Naples. In Wegmann's mill (Fig. 198) porcelain rollers are employed, there being two pairs fed from opposite ends of one hopper in the machine figured. This machine possesses a self-acting pressure and a differential motion, but its most valua

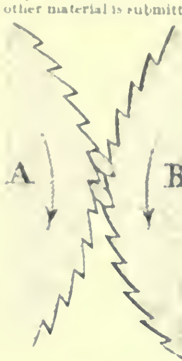


Fig. 197. — Section of Toothed Rollers.

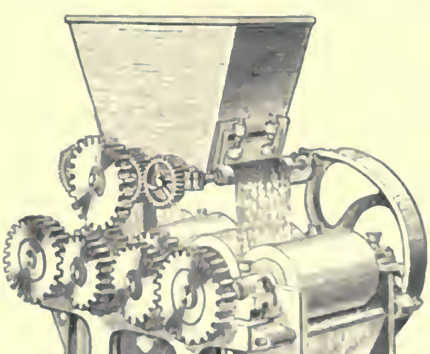


Fig. 198. — Wegmann's Roller-Mill.

ble feature consists in the employment of porcelain for rollers, by which a surface at once exceedingly hard and slightly rough or porous is secured. It is claimed for these rollers that, acting on middlings, they produce, with less expenditure of power, more and better flour than can be obtained by either stones or metal rollers. The roller-mills, however, have not yet been long enough in operation in this country to enable any safe conclusion to be drawn as to their adaptability to American milling; but though the system originated only within the last few years, it has in the mean time practically superseded all other methods in the Austro-Hungarian districts, where milling is carried to greater perfection than in any other part of the world. To show the progress made in the introduction of roller-mills in England, it may be noted that, while in January, 1877, there was only one Wegmann's machine in operation, there were by the close of the year 350 in various mills throughout the country.

The Disintegrator. Under this name a form of machine was invented and introduced a few years ago by the late Thomas Carr for, among other purposes, the manufacture of flour. Carr's disintegrator consists of a pair of circular disks of metal set face to face, and studded with circles of projecting bars so arranged that the circles of bars on the one disk alternate with those of the other. The disks are mounted on the same centre, and so closely set to each other that the projecting bars of the one disk come quite close to the plane surface of the other; and they are enclosed with an external casing into the centre of which a spout passes by which the grain is delivered into the machine. The disks are caused to rotate in opposite directions with great rapidity, making about 400 revolutions per minute, and as the outer circle of bars is 6 feet 10 inches from the centre, they move at a rate of 140 feet a second, or about 100 miles per hour. The grain in passing through the machine is struck by the oppositely revolving studs with enormous force, — a force which increases as the shattered grains approach the outer circles of studs, — and it is almost instantaneously reduced to a powder, which falls under the disks and is carried away by a spiral creeper. It is stated that one of these machines, 7 feet in diameter, is capable of doing the work of as many as 27 pairs of millstones, and they have been fully tested in the flour-mills of Gibson and Walker, Bonnington, near Edinburgh, Scotland, where two of them have been in operation for a period of seven years. Notwithstanding this success, however, the disintegrator has not, to this day, met with general acceptance in England as a flour-mill.

Flour Paste. See CEMENT (FLOUR).

Flour-Sack, a coarse bag for flour, holding usually 280 lbs.

Flower-Basket, a fancy stand or basket for holding flowers in a room.

Flower-Pot, an earthenware or china pot for holding flowering plants.

Flowers, the blossoms of plants. A large trade is carried on by florists in ornamental plants and cut flowers. — In chemistry, the fine mealy matter formed in the process of sublimation is called flowers, as flowers of sulphur, zinc, benjamin, etc.

Artificial F., imitations of flowers and leaves. which form a common article in the dress of ladies. The beauty and value of these pleasing articles of personal decoration mainly depend upon the taste and ingenuity of the maker. The delicate fingers of woman, and her ready powers of imitation and invention, combined with her natural affection for the chaste and beautiful, have enabled her the more especially to excel in this manufacture. There are few branches of ornamental work used in the decoration of ladies' apparel which have more increased in importance than that of *A.-F.* making, in which, both in France and in the U. States, large numbers of workpeople are engaged. Not only has the trade itself greatly extended within the last few years, but the improvement in the manufacture is very marked, and the bouquets and wreaths used in the trimming of dresses may be almost said to rival nature, so truly and delicately are the individual flowers manipulated. *A.-F.* making is almost entirely done by hand, giving occupation principally to young women and children, the majority of whom work at home or in small shops. The numbers employed in New York are about 2,000, of whom about 1,200 are under twenty years of age. In France the numbers are much larger; for ten years ago it was estimated that there were at least 2,000 shops where artificial flowers were made, and it is probable that now these have been increased to 3,000. It is not entirely woman's work, however, for men are employed, particularly in Paris, in cutting out the material for the flowers by a stamp machine, in which 16 or 20 folds are operated upon at once, the folds being colored green, blue, crimson, according to the flower which is to be imitated. Each piece is taken up separately by a girl armed with a pair of pincers, who, with one dexterous movement, moulds it, as it were, roughly into the shape of the flower, and then passes it on to another, who gives a more precise form to the petal. A third girl attaches each petal to a very fine wire, thread having been previously twisted round this wire to form the stalk; while the remaining operations consist in goffering the petals and leaves to give them a curl, and finally gumming or waxing them over, or dusting them with fine powdered glass or potato-flour to represent the bloom. The rapidity and accuracy with which these various processes are completed are very remarkable. A new style of *A. F.* has lately come into vogue, in France more especially, made by the "enamel process," in which a young girl sits by a jet of flame, holding in her hand a stick of prepared glass. A momentary application to the flame makes the end of the stick red hot, and while it is still in a pasty state the operator pulls out a short length, and immediately rolls it up into the form of the petal or leaf, and passes it on to the painter for the proper coloring. The remaining processes are similar to those of the ordinary *A. F.* These enamel flowers, though wondrously true and pretty, are more suited for room decoration than for dress. While apparently a light and pleasant work, *A.-F.* making is not one of the healthiest of our trades, partly for the reason that it is so often carried on in small household shops, where ventilation is of the scantiest. There is always a certain amount of dust and coloring matter flying about the room, which is more or less injurious, though the use of Scheele's green and sulphate of copper (verdigris blue) is almost discontinued, and with it a train of symptoms that usually accompany arsenical poisoning. Weak eyes are a common source of complaint, especially the form called asthenopia, which is particularly induced when white flowers are made by gaslight. In the manufacture of the flowers, the net cost is about three fifths of the whole for material, and the remaining two fifths for the labor.

Imp. duty: artificial and ornamental feathers and flowers, or parts thereof, of whatever material composed, 50 per cent.

Fluate, a salt of fluoric acid.

Flue, a smoke-duct or chimney. A *flue-boiler* is a steam-boiler having passages or flues surrounded by water for the conveyance of the gaseous products of combustion, in distinction from *tubes*, which hold water and are surrounded by fire. — Soft down or loose fur.

Flue-Cleaner and Scraper, a brush of wire or steel slips, or an implement with circular or spiral blades, to clean flue surfaces of steam-boilers.

Fluid, a liquid or gas; any body whose parts yield to the smallest pressure, and are moved among each other without any apparent sensible resistance. — Not solidified.

Fluids are of two distinctive kinds, elastic and non-elastic; the former are comprised under the general term *Pneumatics*,

and include all airs and gases; while the latter, which only include water and other aqueous fluids, are comprised under the general head of *Hydrostatics* and *Hydraulics*. The terms *elastic* and *non-elastic* are only used here in a relative sense, and not absolutely, as all fluids are elastic more or less, water being compressible, although offering resistance.

Flukes, the broad, projecting, triangular hooked plates at the extremity of the arms of an anchor, one or other of which, according as it is tilted, enters the anchorage ground as a hold-fast.

Flume, a water-channel; a stream or run for gold-washing.

Flunkers, persons who think they know all about buying or selling stocks, or who are induced by the persuasion of others to buy or sell; and, being ignorant of the snares of Wall Street, speedily lose their money. — *T. McElrath.*

Fluor-Spar, fluoride of calcium, a common mineral product, occurring in many places in this country. It is of various colors, wine, yellow, greenish, and violet-blue being the most common. It is abundant in Derbyshire, Eng., and is often called Derbyshire spar. Some of the varieties found there are beautifully banded, and are much prized for the manufacture of vases. It is also used for beads, brooch-stones, and other ornamental articles, but is difficult to work on account of its brittleness. Fluor-spar is used as a flux to promote the fusion of certain refractory minerals, — whence the name, from the Latin *fluo*, to flow.

Fluoric Acid, a corrosive liquid, prepared from fluor-spar, used for etching upon glass, roughing the shades of table-lamps, etc.

Flush, a carpenter's term, to express the continuance in the same planes of the surfaces of two contiguous bodies, irrespective of the direction of the fibre or grain. — Anything on the same level, as the deck of a ship, when it extends without break from stem to stern. — A stream of water suddenly thrown on, for cleansing, as in flushing a sewer. — A Scotch term for full, as affluent, flush of money.

Flushing. See Holland.

Flushing, North Shore, and Central R.R. runs from Hunters Point, N. Y., to Babylon, N. Y., 34.34 m.; with branches from Woodside to Flushing, 3.81 m.; Whitestone Junction to Whitestone, 3.89 m.; Flushing to Great Neck, 6.87 m.; Garden City to Hempstead, 1.40 m.; and Bethpage Junction to Bethpage, 1.82 m. This Co., whose offices are in Long Island City, was organized in 1874 by the consolidation of the Flushing and Northside, the Central of Long Island, the Central of Long Island Extension, the North Shore, Whitestone, and Westchester, the North Shore and Port Washington, and the Roslyn and Huntington R.R. Cos., and in 1876 the road and branches were leased to the Long Island R.R. Co. *Financial Statement*, 1878: Cap. stock (authorized $2,500,000) paid in, $814,925; funded debt, $3,155,182.86, of which detail as follows, — North Shore R.R. 1st mortgage 7% 20-year bonds, payable 1885, $125,000; ditto 2d mortgage 7% 20-year bonds, payable 1885, $24,000; Flushing and North Shore R.R. 1st mortgage 7% 20-year bonds, payable 1889, $800,000; ditto 2d mortgage 7% 30-year bonds, payable 1900, $400,000; Central of Long Island R.R., 1st mortgage 7% 30-year bonds, payable 1902, $1,000,000; ditto extra 1st mortage 7% 30-year bonds, payable 1903, $200,000; North Shore, Whitestone, and Westchester R.R. 1st mortgage 7% 20-year bonds, payable 1893, $93,000; New York and Flushing 1st mortgage 7% 20-year bonds, payable 1880, $25,000; consolidation mortgage 7% bonds, $488,183.

Flushings, a kind of heavy and coarse woollen cloth made in lengths of 48 to 55 yards, also called *short-ends* in England.

Flute, a wind instrument which in a variety of forms (Fig. 199) has been in constant use from the earliest ages. In its primitive state the flute was played like the modern flageolet, with a mouthpiece at the upper end; and from the shape of this mouthpiece, which resembled the beak of a bird, it received the name of *flûte à bec*. In this form, with slight alterations, it continued until the beginning of the last century, when it was gradually superseded by the *flauto traverso*, or transverse flute, so called from its being blown by an oval-shaped hole in the side, and consequently held in a horizontal position. At its introduction this instrument was about 18 inches in length, and had but one key. Even in this state it was a great improvement on the old *flûte à bec*. Shortly

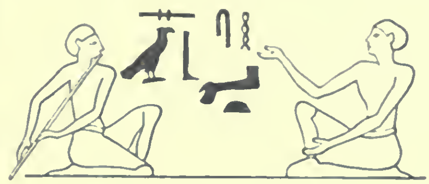


Fig. 199. — Flute of Ancient Egypt.

after a movable head-joint was invented, its length being increased, and more keys added, some flutes at the present time having more than a dozen keys, and few less than six. By means of these they are enabled to execute any music, however chromatic, if within their compass, which extends from C below the treble to C in altissimo. Some few will go four notes lower, and an experienced player will reach E flat in altissimo. The *piccolo*, or octave flute, the E flat or tierce, the D flat or *minor ninth* (transposing piccolo), the *flûte d'amour*, a minor third below the ordinary instrument, — are all varieties of the *flauto traverso*.

Fluted, grooved, furrowed, or channelled.

Flutina, a musical instrument of the concertina description.

Fluting, a piping or frill ornament to a lady's cap or dress. — One of the hollow channels cut in the shafts of columns. — One of the longitudinal grooves in a screw-tap, giving cutting-edges to the thread.

Fluting-Iron, a goffering-iron.

Fluting-Machine, a machine having a pair of rollers, each one having projections which enter the interdental spaces of the other.

Flutter-Wheel, a peculiar kind of wheel to a water-mill, which being placed at the bottom of a chute, receives the impact of the head of water in the chute and penstock.

Flux, any substance used to cause the fusion and reduction of earths or metallic ores by heat. White flux is the residuum of the deflagration in a red-hot crucible of a mixture of two parts of nitre and one of cream of tartar. It is in fact merely a carbonate of potash. Black flux is obtained when equal parts of nitre and tartar are deflagrated. It owes its color to the carbonaceous matter of the tartaric acid, which remains unconsumed, the quantity of nitre being too small for that purpose. The presence of the charcoal renders this preparation a convenient flux for reducing calcined or oxidized ores to the metallic state. Limestone, fluor-spar, borax, and several earthy

or metallic oxides are employed as fluxes in metallurgy.

Fly, that part of a ship's flag which extends from the union to the extreme end. — That part of the machinery of a printing-press which withdraws the sheet, and lays it aside after the impression is made. — The compass-card on which the 32 points are drawn, and to which the needle is attached underneath. — In weaving, a shuttle driven through the shed by a blow or jerk. — In horology, a regulating device used in the striking-parts of clocks and watches, to control the rate of speed. See FLY-WHEEL.

Fly-Boat, a long, narrow boat used on canals; also a larger class of Dutch vessel, flat-bottomed, of several hundred tons.

Flyer, in weaving, a contrivance with arms which revolves around the bobbin in the *bobbin and fly frame*, or the *throstle frame*, which machines draw and twist the *sliver* into a *roving*, or the latter into yarn. — *E. H. Knight.*

Fly-Fishing, trolling in streams with a rod and line, and artificial flies.

Fly-Flapper, a fan or other instrument for keeping off flies.

Flying-Bridge, a temporary bridge.

Fly-Leaf, a spare blank-leaf in a bound book.

Fly-Press, a screw-press deriving its power from weighted arms, swinging in a horizontal plane, as in embossing and die presses.

Fly-Powder, an insect-destroying powder.

Fly-Shuttle, the shuttle impelled by the weaver.

Fly-Wheel, a wheel with a heavy rim (Fig. 200), placed on the shaft of any machinery put in motion by any irregular and intermitting force, for the purpose of rendering the motion equal and regular by means of its momentum. The rim of a fly-wheel, after a few revolutions, acquires a

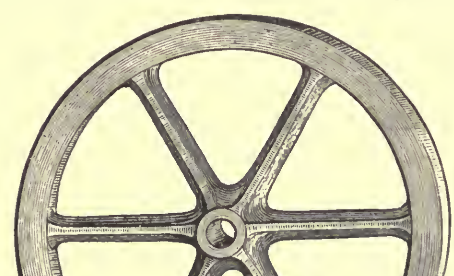


Fig. 200. — FLY-WHEEL.

momentum sufficient to cause it to revolve with a velocity depending upon the resistance of the machinery. In all cases where a rotary motion is to be obtained from a reciprocating one by means of a crank, a fly-wheel is necessary to continue the motion at those two points of the revolution in which the crank lies in the direction in which the moving force acts. The momentum acquired by the fly-wheel urges the crank forward in the direction in which it was previously moving, and continues the rotation, thus making the motion equal and uniform.

Foal, the young of the horse kind; a colt or filly.

Foam-Cock, in a steam-engine, a cock at the water-level to blow off scum.

F. O. B., free on board. A bill or invoice, f. o. b., includes the transportation on shipboard, and all the shipping expenses.

Fob, to cheat, defraud, or impose upon. — A little pocket for a watch.

Focimeter, in photography, an instrument, of which there are several kinds, to assist in focusing an object in or before a camera.

Focus, the point where the rays meet or converge, after passing through a convex glass. — A centre. — A hearth or fireplace.

Focusing-Glass, in photography, a glass used for magnifying the image on the ground-glass in the camera, to enable the operator to get it in better focus. — *E. H. Knight.*

Fodder, a general name for the dry food given to cattle, or stored for the winter. — A weight by which lead is sold in England, varying from 19½ to 23 cwt.

Foglietta, an Italian liquid measure varying from half a pint to a pint.

Fog-Signal, a detonating powder placed on a railroad track, which, when the engine passes over the rails, explodes with a loud report, and gives warning to the driver of danger, etc.

Fog-Trumpet, a horn or trumpet fixed on a vessel, a spar, etc., and blown by steam or any mechanical means, or by the wind, as a warning to mariners.

Foil, a thin leaf of polished metal, placed under precious stones and pastes, to heighten their brilliancy, or to vary the effect. Foils were formerly made of copper, tinned copper, tin, and silvered copper, but the last is the one wholly used for superior work at the present day. Foils are of two descriptions: white, for diamonds and mock diamonds; and colored, for the colored gems. The latter are prepared by varnishing or lacquering the former. By their judicious use the color of a stone may often be modified and improved. Thus, by placing a yellow foil under a green stone that turns too much on the blue, or a red one under a stone turning too much on the crimson, the hues will be brightened and enriched in proportion. — An amalgam of quicksilver and tin at the back of a looking-glass. — A guarded sword and weapon for fencing.

Foil-Stone, an imitation jewel.

Foire [Fr.], a stated market in a town or city.

Folding, the operation of doubling one part of a substance over another. — Putting sheets of printed matter in order for binding. — In agriculture, penning sheep or cattle on land to feed and manure.

Folding-Chair, a chair which is collapsible for carriage or stowage.

Folding-Door, a pair of doors hung from opposite sides of the aperture, and meeting midway of the passage. — *E. H. Knight.*

Folding-Machine, a machine which delivers newspapers or printed book-work folded.

Folding-Net, a net for trapping small birds.

Folding-Screen, an upright portable screen, in several leaves or parts, which shuts up, and can be put away when not in use.

Folding-Stool, a portable or camp stool.

Fold-Yard, an enclosure for keeping cattle.

Fole, a leather bottle used in Spain.

Folio [Lat. *folium*, a leaf], in account-books, signifies page. Thus folio 7 — written abridgedly fo. 7 — denotes the seventh page; Folio recto, or F° R°,

signifies the first page; Folio verso, or F° V°, the second page of a leaf. A book in folio, or simply a folio, is that where the sheet is only folded in two, each leaf making half a sheet.

Folioing, the operation of paging or marking a book.

Fonda, the Spanish name for an inn or tavern.

Fondique, a hall for merchants; an exchange; a customs warehouse in Spain.

Fong, a coin current in Siam, the eighth of a tical, and worth about 8 cents.

Font, a stone basin or vessel in a church, for holding water for the purposes of baptism. — A complete assortment of a particular set of printing-type (also written *Fount*).

Fontange [Fr.], a knot of ribbons on the top of a head-dress.

Foo-chow. See CHINA.

Food, anything which feeds or promotes the natural growth of organic bodies, by supplying them with materials which, by assimilation, may be converted into the substances of which they are composed; or which, by its decomposition or slow combustion, maintains the temperature, or some other essential condition of life, at the proper standard. The numerous articles employed as food are all compounds; and in many cases they consist of mechanical mixtures or chemical combinations of two or more compounds. Organized matter, or that which has possessed either animal or vegetable life, or which has been produced by living organs, seems to be alone capable of assimilation, to any extent, by the animal system; and hence it is from the organic kingdom that our aliments are necessarily derived. Water, iron, earthy phosphates, chloride of sodium, and other salts, which form the inorganic constituents of the body, though not of themselves nourishing, are also assimilated when taken in conjunction with organic aliments, and then contribute essentially to nutrition. In the animal and vegetable substances employed as food these inorganic compounds are provided in small but sufficient quantities to meet the requirements of the healthy body, and in this state of combination alone can they be regarded in the light of aliments. A complete consideration of this subject embraces, not only all the substances used as food, but also those things which when taken with them improve their flavor, promote their digestion, and render them more wholesome and nutritive; and also their preparation for the table in its various relations with health and disease.

Foolscap, a long folio writing-paper, about 13½ by 16½ inches; a foolscap millboard is 18½ by 14½ inches.

Foot, a linear measure of 12 inches, or the third part of a yard. It also expresses surface and solidity. A square foot is the same measure both in length and breadth, containing $12 \times 12 = 144$ square or superficial inches. A cubic or solid foot is the same measure in all directions, or 12 inches long, broad, and deep, containing $12 \times 12 = 144 \times 12 = 1728$ cubic inches to the solid or cubic foot. — The bottom of anything, as of a shoe or stocking. — The rest or support on which a machine or anything heavy stands. — To sum up, as the items of an account; to pay the expenses, as to *foot* the bill.

Foot-Ball, a large ball to be kicked about.

Foot-Bath, a pan in which to wash the feet.

Foot-Board, a support for the feet in a boat, etc., or at a workman's bench.

Footing, the total sum of a column of figures; the art of adding up such column. — The finer detached fragments of the Tenks, or refuse whale-blubber, not wholly deprived of oil. — *To pay footing*, to pay a fee on first doing anything, as working at a trade or in a ship.

Foot-Iron, a carriage-step.

Foot-Key, an organ-pedal.

Footlight, a light on the front of a stage.

Footman, a man-servant. — An iron or brass stand with feet, or with a hook, for keeping anything warm before a fire.

Foot-Plate, the platform of a locomotive, on which the driver and fireman stand.

Foot-Rope, a rope stretched loosely along a ship's yard, for the seamen to stand on in furling the sails.

Foot-Rule, a twelve-inch measuring-stick

Foots, refuse or sediment, as at the bottom of a sugar or oil cask, etc.

Foot-Scraper, an iron scraper at an entrance door, to remove the dirt from the feet before entering.

Footstall, the stirrup of a woman's saddle.

Footstep, an inclined plane under a hand printing-press.

Foot-Stick, in printing, a wedge-shaped implement placed against the foot of a page in locking up the form, and between which and the chase the *quoins* are driven in.

Footstool, a small cushion or stool to rest the foot upon.

Foot-Valve. The lower valve between the condenser and air-pump.

Foot-Waling, the inside planks or lining of a vessel over the floor-timbers and below the lower deck.

Foot-Warmer, a heated stool for the feet. — A chafing-dish.

Forage, provender, or food, suited for horses and domestic cattle, as hay, straw, beans, grass, clover, etc.

Force-Majeure, a French commercial term for unavoidable accidents in the transport of goods, from superior force, the act of God, etc.

Force-Pump, a pump which delivers the water under pressure. In this kind of pump (Fig. 201), the piston, A, has no valve, but there is a valve, B, opening upwards at the bottom of the cylinder. Immediately above this valve, in the side of the cylinder, there is another valve, C, opening outwards into a tube, D, which is bent upwards to

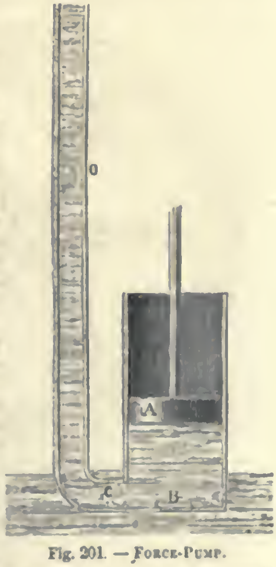


Fig. 201. — FORCE-PUMP.

the height at which the water is to be delivered. On raising the piston, the valve in the bottom of the pump opens, and the water is pressed up into the cylinder, on the principle of the suction-pump. On pressing down the piston, the lower valve closes and the upper one opens, and the water is forced up the tube. When the piston is raised again, the upper valve shuts, retaining the water, and the

lower valve opens. The same process is repeated, and the water is thrown out at every descent of the piston.

Forceps, tweezers, or metal holders of various kinds. — Surgical instruments used in midwifery, and for other purposes.

Forcing, a method of producing fruit, flowers, and vegetables, before their ordinary season of maturity, by artificial heat. — The process of fining wines, so as to render them fit for immediate draught.

Forcing-House, a hothouse.

Forcing-Pit, an enclosed hotbed or frame with a glass roof, containing a fermenting mass of dung for accelerating the growth of plants, etc.

Ford, the most shallow part of a stream or frith, which may be passed through on foot by wading, or crossed on horseback.

Fore, a maritime term for anything near, or pertaining to, the bow or stem, the forward part of a ship; as foremast, forefoot, etc.

Fore and Aft, a seaman's term for "in the direction of the ship's length"; from head to stern.

Fore-Cabin, the cabin in the front part of a ship, which has inferior accommodation for passengers.

Forecastle, a short deck in the bow of a ship, above the upper deck, in advance of the foremast; the forward part of the ship under the deck, where the sailors live in merchant vessels.

Forefoot, a piece of wood at the foremost extremity of the keel of a ship.

Foreganger, a short piece of rope grafted on a harpoon, to which the line is bent.

Foreign-going Ships, vessels trading to ports beyond the limits of the U. States. The term, however, does not apply to vessels trading with the Dominion of Canada.

Forelock, a flat piece of iron driven through the end of a bolt to prevent its drawing.

Foreman, an overseer; a chief workman. — The president or spokesman of a jury. — An inferior seaman.

Foremast, the first or forward mast in a ship; that nearest the bow.

Forepeak, the place allotted to the crew in merchant-ships.

Foreright, coarse wheaten bread.

Forerunner, a piece of rag terminating the stray line of the log-line of a ship.

Foresail, the large lower square sail on the foremast of a ship; the first triangular sail before the mast of a sloop or cutter.

Forest, a great wood; ground covered with a natural growth of trees.

Forester, one connected with forests.

Forest-Wool, a coarse, brownish fibre obtained by boiling pine leaves in a solution of caustic alkali, and subjecting them to other chemical processes. This fibrous material, mixed with sheep's wool, is used in the manufacture of blankets; and forest-wool yarn is manufactured into jackets, drawers, etc.; the fibre is made in Silesia. — *T. McElrath.*

Forestay, the rope supporting the foremast of a ship.

Foret [Fr.], a gimlet, or drill.

Fore-Tackle, tackle on the foremast, and also tackle used for stowing the anchor.

Foretop, the platform erected at the head of the foremast.

Foretop-Mast, the mast erected over the foremast, and above which is fixed the foretop-gallant-mast.

Foretopmen, men stationed in the foretop, in readiness to set or take in the smaller sails, and to keep the upper rigging in order.

Forge, and **Forging**. When iron has gone through the various processes of smelting, refining, puddling, shingling, etc., it is ready to be *forged* into some or other of the infinitely numerous and varied forms required in the practical arts. This forging is a combination of heating and hammering. The forge is the hearth or furnace where the heating takes place, movable, or fixed, as the case may be; and the hammer may be worked by muscular power, mechanical power, or steam and air power, according to the arrangements. Practically, the forging commences when the white-hot iron is subjected to the ponderous blows of the shingling hammer; but the term is usually applied to the later process. The larger operations of forging are those in which several pieces of iron are welded together into one by repeated blows at a white heat. Such is the mode of making crank-shafts for steam-engines, and paddle-shafts for steamers, when masses are welded together to the collective weight of 20 tons or more. For smaller work bars are piled or fagoted around a central

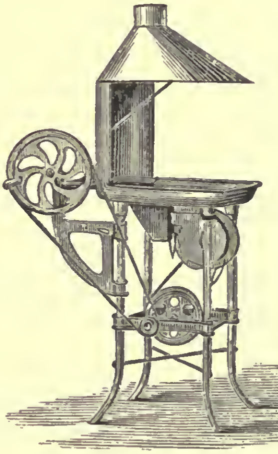


Fig. 202. — Portable Forge.

rod, or fragments of scrap-iron are enveloped in an old piece of sheet-iron, and then hammered into one piece. In short, there is hardly a limit to the variety of modes in which many pieces of iron are hammered into one, or a single piece hammered into a particular form. The ordinary open forge, or smith's hearth, is well known. There is a hearth of brick-work, 5 or 6 feet square; one side is extended to a vertical wall leading to the chimney, the lower end of which terminates in a hood of stout plate-iron. The back wall of iron is perforated to receive the blast from the bellows, or blowing-machine. This is the larger kind of hearth. The smaller, used for cutlery and small forgings, is raised 2 or 3 feet from the ground, with a hearth about three feet square; or, if there are two fires under one hood, the hearth may be 6 feet by 3. There is a trough or compartment for water, another for coals, and an ash-pit under the arch; the anvil weighs from 2 to 4 cwt., and is raised 2 to 3 feet from the ground. There are many forms of *portable forge.* In one of these (Fig. 202) the hearth is supported on four iron legs; the bellows, under the hearth, are worked by a lever handle extending obliquely upwards, and force air up a tube to the level of the hearth.

When made portable, the bellows and frames are placed on the hearth; the pipe and the legs are packed on the top and sides of the bellows; the hearth and its side plates form a box to contain the various pieces; and a cover closes down over the whole. Various matters connected with the forge and forging will be found treated under BELLOWS, BLOWING-MACHINE, CUTLERY MANUFACTURE, HOT-BLAST, IRON MANUFACTURE, STEAM-HAMMER, etc.

Forger, in the cutlery-trade, one who forms or fashions a tool or implement from the bar or rod of steel. — One who counterfeits coins, or issues false documents.

Forgery, a fraudulent or counterfeit imitation or deception, practised in the making or uttering a false instrument, or by altering a note, check, or order, with a fraudulent intent. It may be committed not only as to a whole document, but as to part of one, *e. g.* by an alteration in the amount of a bill, whereby the person who has engaged for a certain sum is made to appear bound for a larger. It is in its effect on the rights of the parties to negotiable documents only that it is connected with the subject of this work. No man can be made liable by his signature being forged by another, though one may in such circumstances create a liability by acknowledging the signature as his own. In the general case, acceptance of a bill is an acknowledgment of the drawer's signature, which will make the acceptor fully liable to third parties. Acceptance is not, however, held to be an acknowledgment of an indorser's signature. Whoever pays a forged bill (whether a drawee, or a banker at whose house it is made payable) is presumed, also, to have admitted or guaranteed the signatures of the parties, and will not recover his money, unless he find out the *F.* immediately, before circumstances affecting the position of other parties have intervened, and send notice on the day on which he made payment. A person so paying will not have recourse on the party who appears, through means of *F.*, as drawer of an unaccepted or acceptor of an accepted bill. A party who pays for honor is under like liabilities should the name of the person he has so paid for have been forged. "Whoever," says Bayley, "pays a bill, should be satisfied that it is, in all its parts, genuine; if he be not, he will pay it at his peril, and will lose his remedy against the party on whose account he pays it." In the case of vitiations and alterations, this distinction has to be considered, — that where, through the carelessness of the original maker of the document, facilities have been left for alteration without detection (as where room is left for adding a word to the sum and thereby increasing it), he will be responsible for what appears on the face of the paper.

Fig. 203. — EGYPTIAN FORK.

Fork, an agricultural implement of great antiquity, being referred to in the Book of Judges, and represented on the Egyptian tombs at Thebes (Fig. 203). It is divided at the end into two or more points or prongs, and used for lifting, digging, carrying, or throwing. There are *F.* of different kinds, as the *digging-F.*, *dung-F.*, *grain-F.*, *hay-F.*, *pitch-F.*, etc. — The table-*F.*, for taking up food, is only about three centuries old. In ancient times, as is the practice still in the East, meat was commonly prepared as stews; or, if roasted, it was cut into small pieces by a carver, so as to be easily taken in mouthfuls by the guests, who used their fingers and a knife for the purpose. It certainly is a strange fact, that the use of any species of *F.* at table was quite unknown till the 15th century, and they were then known only in Italy, which has the merit of this invention. None of the sovereigns of England had *F.* till after the reign of Henry VIII.; all, high and low, used their fingers. The first royal personage in England who is known to have had a *F.* was Queen Elizabeth; but although several were presented to her, it remains doubtful whether she used them on ordinary occasions.

Table-F. Making differs from cutlery-work generally in requiring stamping. A rod of steel, heated at the forge, is fashioned into tang, shoulder, and shank, with a piece at one end beaten out flat for the *mood* or *mould*. This mood becomes the prongs; it is heated, and placed in a steel boss or die. An upper die is attached to the lower face of a heavy weight, and by allowing this weight to fall through a height of several feet, the prongs are stamped out of the mood by the cutting action of the die and counter-die, as well as the *bosom*, or curved part, which connects the prongs with the shank. After a little filing, the *F.* is ready for grinding. This is done on a dry stone, and is very destructive to health. (See GRINDING.) Wire-gauze shields for the mouth, and special ventilation of the grinding-rooms, are to some extent adopted; but the *F.*-grinders are too often a reckless body of men, regardless of health, earning large wages, and prone to the maxim of leading "a short life and a merry one." The finishing processes by laps, glaziers, and polishers (see POLISHING), require much ingenuity to reach all the curvatures and corners of the *F.*

Fork-Chuck, a short piece of steel which fits into one of the sockets or chucks of a lathe, used by wood-turners for carrying round the piece to be turned; it is flattened at the end like a chisel, but has a projecting centre-point, to prevent the wood from moving laterally.

Forkstaff-Plane, a joiner's plane for working convex cylindrical surfaces.

Fork-Tail, a salmon four years old.

Forlon, a Spanish chaise or carriage with four seats.

Form, shape. — A mould in which anything is wrought. — A mass of type, in pages or columns, ready for press. — The arrangement of newspaper columns or the pages of a book in an iron chase, for machinery or printing. — A long wooden bench.

Former, a shape around which an article is moulded, woven, wrapped, pasted, or otherwise constructed.

Formic Acid, an organic acid, obtained by oxidizing many organic substances, and found in the red ant. It is a burning liquid of an irritating odor. It is exceedingly corrosive, producing a sore if dropped upon the skin. It boils at 221°–5°, yielding an inflammable vapor, burning with a pale-blue flame. Sp. gr. at 32°, 1.222. It is readily distinguished from acetic acid, which in many points it resembles, by heating it with a little solution of oxide of silver or mercury; the metal is reduced, and precipitated in a pulverulent state, while carbonic acid is extricated. The odors of the two acids also vary.

Formosa. See CHINA.

Formula, in pharmacy and medicine, a short form of prescription; a recipe. By chemists the term is applied to a grouping of symbols, expressing the composition of a body; thus, HCl (standing for 1 atom of hydrogen united to 1 atom of chlorine) is the formula for hydrochloric acid.

Forril, lambskin parchment.

Fort de France. See MARTINIQUE.

Fortin, a dry measure at Constantinople; rather less than 4 bushels.

Fort Wayne, Jackson, and Saginaw R.R. runs from Jackson, Mich., to Fort Wayne, Ind., 100 m. This Co., whose offices are in Jackson, was formed by the consolidation in 1869 of the Jackson, Fort Wayne, and Cincinnati and the Fort Wayne, Jackson, and Saginaw R.R. Cos. The road was opened in 1870. *Financial statement:* Cap. stock, \$1,149,950; funded debt, \$2,000,000, consisting of 1st mortgage 20-year 7% bonds, \$1,500,000, payable in 1889, and 2d mortgage 8% 20-year bonds, \$500,000, payable in 1891.

Fort Wayne, Muncie, and Cincinnati R.R. runs from Fort Wayne, Ind., to Connorsville, Ind., a distance of 104.18 m. This Co., whose offices are in Fort Wayne, opened the road in 1870. *Financial statement:* Cap. stock, \$1,000,000; funded debt, \$2,745,000, as follows, — 1st mortgage, issued 1869, payable 1889, \$1,800,000, interest 7% (April and Oct.); 2d mortgage, issued 1871, payable 1896, \$500,000, interest 8% (April and Oct.); equipment mortgage, issued 1871, payable 1881, \$345,000, interest 8% (Jan. and July).

Forward, the forepart of a ship. — To send forward; to transmit, as a letter, a despatch, etc.

Forwarder, one who acts as agent for the owner in the transshipment, transmission, or forwarding of goods; a forwarding-merchant.

Forwarding-Merchant, one who receives and forwards goods to distant consignees, for which he receives a compensation from the owners, but who has no concern in the vessels or vehicles by which they are transported, and no interest in the freight; he is not a common carrier, but a warehouse man or agent, and is required to use only ordinary diligence in sending the merchandise by responsible persons and properly appointed conveyances.

Fosset, a small chest.

Fossils, petrified shells, animals, plants, etc.

Fostel (Scotch), a cask.

Fother, Fodder, in navigation, to draw a sail filled with oakum under a ship's bottom in order to stop a leak. — A cart-load. — A large quantity. — A weight for lead, ordinarily 2,184 lbs., or 8 pigs, but variable. See FODDER.

Fotmal, a commercial term for 70 lbs. of lead.

Fou [*Scotch*], a pitchfork; a firlot or bushel.

Fouang, a coin of Siam, the half of a mace, called by the natives phuani, worth 800 cowries; also a weight the 8th part of the tical, and equal to 29½ grains.

Foudre, a large cask or vessel used in France and Germany, and varying from 142 up to 654 gallons.

Foul, a sea-phrase that is used in distinction from clear, and implies entangled, embarrassed. Hence, *F.* anchor, when the cable is twisted round the stock and flukes; *F.* bottom, when a bay is covered with weeds, grass, shells, filth, and rocks. *F.* hawse means that the cables are turned round each other by the ship having swung the wrong way when moored. *F.* rope, a rope entangled and unfit for immediate use. *F.* water is water troubled, and rendered turbid by the ship's bottom rubbing on the ground. *F.* wind is used to express that the wind is unfavorable, or contrary to the ship's course, as opposed to large or fair.

Foulard, a kind of silk material for ladies' dresses, plain, dyed, and printed; a silk kerchief or cravat.

Foul-Proof, an uncorrected printed slip, before the typographical and other errors have been rectified.

Foundation, the basis on which a superstructure rests, as a bridge or building.

Foundation-Muslin, an openwork gummed fabric, used for stiffening dresses and bonnets.

Foundation-Stone, the first or corner-stone of a building in large erections, usually laid in public and with some ceremony.

Founder, one who founds, establishes, or erects; one who lays a foundation; an originator; an endower.— A caster of metals. — The act of a ship's sinking.

Founders-Dust, charcoal-powder, and coal and coke dust ground fine, and sifted for casting purposes in foundries.

Founding. See CASTING.

Foundry, the place where masses of metal are melted and run into moulds.

Fount. See FONT.

Fig. 204. — AMERICAN SODA-FOUNTAIN.

Fountain, an artificial receptacle for water. — A machine by which water is spouted out, generally consisting of pipes or jets of water flowing from statues, vases, etc., in public squares, gardens, or private conservatories, etc. — An apparatus (Fig. 204) containing ice and a coil through which aerated water, known as "soda-water," is conducted from a copper vessel placed under the box to the nozzle, when it is drawn into glasses. *E. H. Knight.*

Fourgon, a tumbrel, or ammunition wagon. — A kind of French baggage-cart. — A fire-poker. — An oven-fork or coal-rake.

Four-in-Hand, a coach driven with four horses.

Fourneau, a stove, or kiln, in France.

Fourpence, an English silver coin ($29\frac{1}{11}$ grains), also known as a groat.

Four-Poster, a large square bedstead, with upright pillars at each corner, supporting a canopy or curtains.

Fourth-Rate, a gunboat carrying from 1 to 4 guns; formerly a vessel of war carrying from 50 to 70 guns.

Fowl, a very general name for the denizens of the poultry yard; but for the most part restricted to the cock and hen (*Gallus domesticus*), of which the breeds are now very numerous.

Fowler, one who pursues or traps wild fowl.

Fowling-Piece, a light long-barrelled gun.

Fox, a seaman's name for a kind of strand of two or more rope-yarns, twisted together. — To put new soles on boots. — A carnivorous animal (*Canis vulpes*). The skin of some of the Northern foxes forms an article of commerce. The most valuable are those of the black fox and silver fox, which are purchased for the Russian and Chinese markets. The red fox is that chiefly brought to market.

Foxed, timber or paper discolored by incipient decay.

Foxglove. See DIGITALIS.

Fractional Currency, notes issued by the U. States Government for the fractions of a dollar, to wit, 50, 25, 15, 10, and 5 cents. The issue of these notes was authorized by act of March 3, 1863; limited to \$50,000,000 by act of June 30, 1864; and discontinued in 1878. The total amount issued was \$49,102,660.27; the total amount outstanding on June 30, 1878, redeemable on presentation, was \$16,547,768.77. See NATIONAL DEBT.

Fracture, a severance; damage or injury done.

Fragile, brittle, easily broken, as glass, pottery, etc.

Frail, a package or basket made of rushes, in which dried fruit is occasionally imported, varying from 32 to 56 lbs. in weight.

Fraise, the French name for a strawberry.

Frame, a word of varied signification; the border or enclosure for a picture. — The wood-work in which panes of glass are placed for windows. — The outward work of doors or window-shutters, enclosing panels. — The strong work which supports the boiler and machinery on the axles of a locomotive engine. — A support for printers' cases of type. — A mould. — The ribs or stretchers for an umbrella or parasol. — The timbers or skeleton of a house or ship.

Frame-Maker, a name applied to several mechanical trades, etc., as a picture-frame maker, printers'-frame maker, etc.

Framework, a term in the hosiery-trade for a hand process of weaving the woollen or cotton thread up into the knitted fabric.

Framingham and Lowell R R. runs from Framingham to Lowell, Mass. This Co., whose offices are in Fitchburg, Mass., was chartered in 1870, and the road opened in 1871. It has been operated since Feb. 1879, by the Old Colony R R. Co. *Financial Statement:* Cap. stock, \$512,-098.39; funded debt, \$750,000, consisting of 1st mortgage 7% 20-year bonds, payable 1891, \$500,000; coupon 8% 10-year notes, payable 1882, \$150,000; coupon 8% 10-year notes, payable 1883, \$100,000.

Franc, a French silver coin of the value of $18\frac{6}{10}$ cents by mint valuation. The franc is the monetary unit of France, and all other coins, whether copper, silver, or gold, are its mere divisions and multiples, by whatever name they may be called.

France, an important republic of W. Europe, extending from lat. 43° to 51° N., and from lon. 7° 35' to 4° 43' W. The boundaries of France are: N., the English Channel (*Manche*), the Straits of Dover (*Pas-de-Calais*), Belgium, and Luxembourg; E., Germany (Alsace-Lorraine), Switzerland, and Italy; S., the Mediterranean and Spain; W., the Atlantic Ocean. From N. to S. its length is about 576 m., measured from Dunkirk to the Col of Falguères; its breadth from E. to W. is about 494 m., from Mont Donon to Cape Saint-Mathieu at the extremity of Brittany, which projects into the Atlantic like a wedge, and without which *F.* would approach in form to a square; and its superficial extent, including Corsica and the small islands on the coasts, is 204,147 sq. m. Though in point of extent of coast and ready access to the sea *F.* is far inferior to Great Britain and Ireland, it is, on the other hand, more fortunate in these respects than the vast inland territories of Austria and Russia, — its coast line extending 395 m. on the Mediterranean, 572 m. on the North Sea, the Straits of Dover, and the English Channel, and 584 on the Atlantic. The country has the advantage likewise of being separated from its neighbors by natural barriers of great strength, the Pyrenees forming a powerful bulwark on the S. W., the Alps on the S. E., and the Jura and the Vosges mountains on the E. The boundary line on the side of Belgium is the only one which nature has left unprotected. *F.* enjoys, upon the whole, greater natural advantages than any other country in Europe. Her territory is above a half larger than that of Great Britain and Ireland, and both her soil and climate are better, — there being a greater amount of summer heat to bring the fruits of the earth to perfection. She has a greater proportion of arable land than any of her neighbors; the natural means of communication throughout her provinces are abundant and easy; she is well provided with all the useful metals except tin, and is better supplied with coal than any other country of Europe but Britain. Even during the distractions of her great Revolution, though her foreign trade was annihilated, her agriculture and manufactures were extended and improved, her population was increased, and its condition ameliorated. In addition to the vegetable productions that grow in England, the climate of *F.* enables her to raise vines, olives, mulberries, and chestnuts. Wine and olive-oil are two of her most valuable productions. The cotton-trade has assumed great importance in the northern and eastern provinces; and Lyons has been long famous as the centre of the silk-trade of Europe, — a branch of manufacture that has been brought to great perfection in that city. The manufactures of woollen cloth, flax, hemp, and iron are also very extensive. The government always maintains a large standing army, amounting in 1879, on the peace establishment, to 496,442 men and 124,279 horses. Her armed fleet on service is superior in number of ships to that of Britain, with about 60,000 men. — The present constitution of *F.*, voted by the National Assembly, elected in 1871, bears date February 25, 1875. It vests the legislative power in an assembly of two houses, the Chamber of Deputies and the Senate, and the executive in a chief magistrate called the President of the Republic. The Chamber of Deputies is elected by universal suffrage. There were 9,982,329 "électeurs politiques," or persons possessing votes, at the general election of 1878. The only requisite to be an elector is to be possessed of citizenship, and to be of the age of

21 years, while the only requisite for a deputy is to be a citizen, and 25 years of age. There are 532 members in the Chamber of Deputies. The Senate is composed of 300 members, of whom 75 hold their seats for life, the vacancies being filled by the choice of the Senate. The remaining 225 seats are divided by lot into three classes of 75 each, one class going out at successive periods of three years. The election of these 225 senators is by an indirect process. In the first instance, the communes and municipalities of *F.* elect, by a majority of their members, a fixed number of "électeurs sénatoriaux," who in their turn, after a lapse of two months, meet together to choose the senators. The first meeting of the municipal councils for the choice of electors, under the constitution of 1875, was in October, 1878, and the first meeting of the electors, numbering 43,127, in January, 1879. No other qualification is required for a senator than to be a Frenchman and 40 years of age. The Senate and the Chamber of Deputies assemble every year on the second Tuesday in January, unless a previous summons is made by the President of the Republic, and they must remain in session at least five months every year. Both begin and finish their session at the same time. The President of the Republic pronounces the close of the session, and has the right of convoking the Chambers for an extraordinary meeting. He is bound to convoke them if the demand is made by one half of the number of members composing each Chamber. The President can adjourn the Chambers, but the adjournment cannot exceed the term of a month, nor occur more than twice in the same session. The Senate has conjointly with the Chamber of Deputies the right of initiating and framing laws. Nevertheless, financial laws must be first presented to and voted by the Chamber of Deputies. Both the Senators and the Deputies receive payment for their services at a fixed rate per diem. In the budget for 1878 the expenses connected with the Senate were fixed at 3,865,600 francs, and those of the Chamber of Deputies at 6,521,000 francs, being a total of 10,386,600 francs, or $2,077,320. The President of the Republic is chosen for seven years by the Senate and Chamber of Deputies voting together. He promulgates the laws passed by the parliament; he has the command of the land and sea forces, but cannot declare war without the advice of the Chambers; he makes treaties of peace, alliance, and commerce, nominates to all government offices, and has power to dissolve the Chamber of Deputies, with the sanction of the Senate. He receives a yearly salary of 600,000 francs, with an allowance of 162,400 francs for household expenses. The executive department of the government is administered by the President of the Republic and his cabinet council, consisting of nine ministers, viz.: — the minister of justice and keeper of the seals; the minister of foreign affairs; the minister of the interior; the minister of finance; the minister of war; the minister of marine and colonies; the minister of public instruction, ecclesiastical affairs, and the fine-arts; the minister of agriculture and commerce; and the minister of public works; they are appointed by the President of the Republic, and are responsible to the Chamber. They receive a salary of 60,000 francs, and may live, if they choose, in the "hôtels" where the duties of their ministry are discharged. — Administratively, *F.* is divided into 87 *departments*, cut rather arbitrarily out of the territory of the provinces into which the country was divided prior to 1793. These departments are subdivided into 362 *arrondissements*, 2,865 *cantons*, and about 36,000 *communes*. Each department is administered by a *prefect* appointed by the President of the Republic, and each arrondissement by a *sub-prefect*. The prefects are divided into three classes, the salary being 35,000 francs for the first class, 24,000 for the second class, and

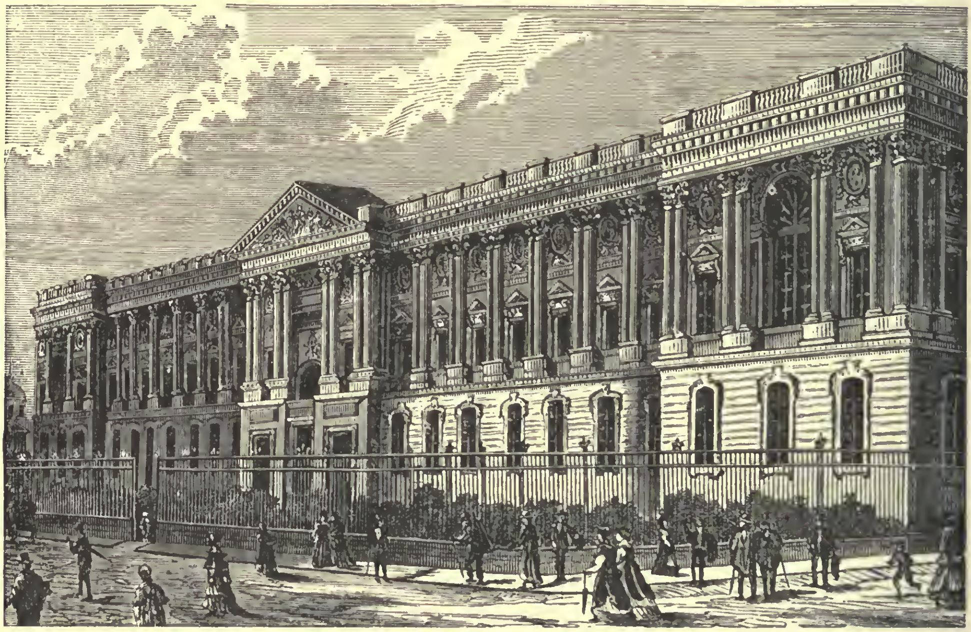


Fig. 205. — Colonnade of the Louvre.

18,000 for the third class. The prefect of the Seine has 50,000 francs a year. The authority of each prefect is great in his own department: he can issue local decrees; he appoints and dismisses a number of agents who depend directly upon him; he is at the head of the police to maintain public order, and for this purpose can summon the military forces; he superintends the collection of taxes; he is in correspondence with all the subordinate functionaries in his department, to whom he transmits the orders and instructions of the ministers; in one word, he is the general agent of government, and the principal instrument of centralization in the state. He is assisted in his work by two bodies, the general council (*conseil général*), which is elected by universal suffrage, and the council of prefecture, which is nominated by the head of the executive power. The business of the council of prefecture is to decide all legal questions, and to advise the prefect, when asked to do so. The general councils assess the taxes, authorize the purchase, sale, or exchange of departmental property, superintend the management of the same, decide about new roads, railways, or canals, vote the budget for sanitary and charitable institutions belonging to the department, and give advice on every matter of local interest, political questions being strictly excluded. The law of Feb. 23, 1872, however, has invested them with great political importance; in case of the parliament being violently dissolved by a *coup d'état*, they must immediately assemble, and form a new parliament with their delegates, in order to oppose by all means the criminal attempt. As the prefect in the department, so the sub-prefect, with a more limited authority, is the representative of the central power in the arrondissement. He is assisted, and to a certain extent controlled, in his work by the council of arrondissement, — an elective body to which each canton of the arrondissement sends one member. Except in that case, the canton is not an administrative division. The commune is the administrative unit in *F.* At its head is a mayor assisted by deputy-mayors (*adjoints*), the number of whom varies according to the population; communes of 2,500 inhabitants have one deputy-mayor; up to 10,000 inhabitants they have two, from 10,000 to 30,000 three, and one additional for every 20 000. The mayor has a double part to perform, as he represents both the central power and the commune; and often it is a difficult matter to avoid a conflict of duties. He is, besides, *officier de l'état civil*, or officer register of births, marriages, and deaths. The mayor and deputy-mayor are not salaried officials. In large towns they are nominated by the government, but they must always be chosen out of the *municipal council*, which is elected on the principle of universal suffrage, and has with regard to the commune much the same power and duties as the general council with regard to the department. The population of *F.*, which in 1801 was 27,349,003, was 36,905,788 in 1876, of whom 11,405,000 were living in towns. The following table shows the extent of each department, and the population according to the census returns of 1861, and of December 31, 1876.[1]

	Surface in Square Miles.	Population in 1861.	Population in 1876.
Ain	2,239	369,767	365,462
Aisne	2,839	564,597	560,427
Allier	2,822	356,432	405,783
Alpes (Basses-)	2,685	146,368	136,166
Alpes (Hautes-)	2,158	125,100	119,094
Alpes-Maritimes	1,512	194,578	203,604
Ardèche	2,134	388,529	384,378
Ardennes	2,020	329,111	326,782
Ariége	1,890	251,850	214,795
Aube	2,317	262,785	255,217
Aude	2,438	283,606	300,065
Aveyron	3,371	396,025	413,826
Belfort (territory of)	235	......	68,600
Bouches-du-Rhône	1,971	507,112	556,379
Calvados	2,132	480,992	450,220
Cantal	2,217	240,523	231,086
Charente	2,294	379,081	373,950
Charente-Inférieure	2,631	481,060	465,628
Cher	2,779	323,393	345,613
Corrèze	2,265	310,118	311,525
Corse	3,377	252,889	262,701
Côte-d'Or	3,383	384,140	377,663
Côtes-du-Nord	2,658	628,676	630,957
Creuse	2,150	270,055	278,423
Dordogne	3,545	501,687	489,848
Doubs	2,019	296,280	306,094
Drôme	2,518	326,684	321,756
Eure	2,300	398,661	373,629
Eure-et-Loire	2,268	290,455	283,075
Finistère	2,595	627,304	666,106
Gard	2,253	422,107	423,804
Garonne (Haute-)	2,429	484,081	477,730
Gers	2,425	298,931	283,546
Gironde	3,761	667,193	735,242
Hérault	2,393	409,391	445,053
Ille-et-Vilaine	2,597	584,930	602,702
Indre	2,624	270,054	281,248
Indre-et-Loire	2,360	323,572	324,875
Isère	3,201	577,748	581,680
Jura	1,928	298,053	288,823
Landes	3,597	300,839	303,508
Loir-et-Cher	2,462	269,029	272,634
Loire	1,838	517,603	590,603
Loire (Haute-)	1,916	305,521	313,721
Loire-Inférieure	2,654	580,207	612,972
Loiret	2,614	352,757	360,903
Lot	2,012	295,542	276,512

	Surface in Square Miles.	Population in 1861.	Population in 1876.
Lot-et-Garonne	2,067	332,065	316,920
Lozère	1,996	137,367	138,319
Maine-et-Loire	2,750	526,012	517,258
Manche	2,289	591,421	539,910
Marne	3,159	385,498	407,780
Marne (Haute-)	2,402	254,413	252,448
Mayenne	1,996	375,163	351,933
Meurthe	[2,352]	428,643	......
Meurthe-et-Moselle	2,020	......	404,609
Meuse	2,405	305,540	294,054
Morbihan	2,625	486,504	506,573
Moselle	[2,073]	446,457	......
Nièvre	2,632	332,814	346,822
Nord	2,193	1,303,380	1,519,585
Oise	2,250	401,417	401,618
Orne	2,354	423,350	392,526
Pas-de-Calais	2,550	724,338	793,140
Puy-de-Dôme	3,070	576,409	570,207
Pyrénées (Basses-)	2,945	436,628	431,525
Pyrénées (Hautes-)	1,750	240,179	238,037
Pyrénées-Orientales	1,592	181,763	197,940
Rhin (Bas-)	[1,758]	577,574	......
Rhin (Haut-)	[1,586]	515,802	......
Rhône	1,077	662,493	705,131
Saône (Haute-)	2,062	317,183	304,052
Saône-et-Loire	3,302	582,137	614,309
Sarthe	2,397	466,155	446,239
Savoie	2,224	275,039	268,361
Savoie (Haute-)	1,664	267,496	273,801
Seine	184	1,953,660	2,410,849
Seine-Inférieure	2,330	789,988	798,414
Seine-et-Marne	2,215	352,312	347,323
Seine-et-Oise	2,164	513,073	561,990
Sèvres (Deux)	2,317	328,817	336,655
Somme	2,379	572,646	556,641
Tarn	2,317	353,633	359,232
Tarn-et-Garonne	1,436	232,551	221,364
Var	2,327	315,526	295,763
Vaucluse	1,670	268,255	255,703
Vendée	2,588	395,695	411,781
Vienne	2,691	322,028	330,916
Vienne (Haute-)	2,130	319,595	336,061
Vosges	2,279	415,485	407,082
Yonne	2,868	370,305	359,070
Total	204,147	37,472,732	36,905,788

[1] After the cession of territory to Germany in 1871, a single department (Meurthe-et-Moselle) takes the place of two (Meurthe and Moselle), the Bas-Rhin disappears, and of the Haut-Rhin there remains only the territory of Belfort.

The increase of population in *F.* within the last century and a half has been comparatively less than in any other State of W. Europe. The natural increase, from the surplus of births over deaths, amounted, when at its highest, between the years 1820 and 1830, to not quite 280,000 per annum, and during part of the decennial period from 1850 to 1860, sank to 51,200 per annum. There was a slight recovery during the first half of the next decennial period, but in the year 1869 the surplus of births over deaths had again fallen to 84,206. In the following two years, 1870 and 1871, the deaths exceeded the births, the excess of deaths amounting to 103,394 in 1870, and to 444,889 in 1871. In the year 1872 there was again a surplus of 172,937 births, and the surplus continued in 1874 and 1875. The birth-rate per hundred inhabitants was 3.11 in 1827, and had fallen to 2.62 in 1868. It fell to 2.57 per cent in 1869, and to 2.26 per cent in 1871, and was 2.61 in 1873, and 2.64 in 1875, — a birth-rate lower than that of any other country in Europe. — The following table, compiled from the last official returns, gives the number of births, deaths, and marriages, with the surplus (+) or deficiency (—) of births over deaths in each of the fifteen years from 1862 to 1876.

Years.	Births.	Deaths.	Marriages.	Surplus (+) or deficiency (—) of Births over Deaths.
1862	995,167	812,978	303,514	+182,189
1863	1,012,794	846,917	301,376	+165,887
1864	1,005,880	860,334	299,579	+145,546
1865	1,005,753	921,887	298,838	+ 83,866
1866	1,006,258	884,573	302,186	+121,685
1867	1,007,515	866,887	300,333	+140,628
1868	984,140	922,038	301,225	+ 62,102
1869	948,526	864,320	303,482	+ 84,206
1870	943,515	1,046,909	223,705	—103,394
1871	826,121	1,271,010	262,476	—444,889
1872	966,001	793,064	352,754	+172,937
1873	946,364	844,588	321,238	+101,776
1874	954,652	781,709	303,113	+172,943
1875	950,975	845,062	305,427	+105,913
1876	966,682	834,074	291,336	+132,608

Not included under either the births or deaths of the above table are the *mort-nés*, or dead-born. The number of *mort-nés* was 39,778 in 1854, and gradually increasing, reached 44,680 in the year 1876. The births of 1877 consisted of 899,376 legitimate, and of 67,306 illegitimate, or *natural* children, the latter forming 7.12 per cent of the total. In the capital, represented by the department of the Seine, the proportion of illegitimate children was 25.21 in the year 1876. The proportion of male to female children born was 106 to 100 previous to 1840, but since the latter date the male preponderance has been gradually declining, and in 1876 had fallen to 105.2 to 100 for the whole of France, and to 102.1 to 100 for all Paris births. — The population of *F.*, like that of most other European countries, is agglomerating ever more in towns. In 1846 the rural population constituted 75.58 per cent of the total, and the urban 24.42 per cent; in 1856 the rural had fallen to 72.69, and the urban risen to 27.31 per cent; in 1866 the rural was 69.54, and the urban 30.46 per cent; and finally, at the census of 1876, it was found that the rural population constituted but 65.10, and the urban 34.90 per cent of the entire population. There is scarcely any emigration from *F.*, the only exodus that has taken place in recent years consisting in a movement of the Basques, in the department of the Hautes-Pyrénées, to quit their country, in order to escape military service. In 1873 and 1874 there emigrated 12,000 Basques to South America, chiefly to the Argentine Republic and Uruguay. The stationary character of the mass of the pop. is shown also by there being little migration within the country. At the census of 1872 it was found that of the total of 36,102,921 individuals constituting the pop. of *F.*, 30,676,943 were born within the registration districts. Thus out of every 100 individuals but 15 had quitted their native commune and 85 lived where they were born. Almost the whole of the existing migration is that from the rural districts into the towns of *F.* The following table of the pop., arranged according to employments (exclusive of children and servants), is taken from the census of 1872.

	Men.	Women.	Total Number.
Agriculture	4,664,855	1,305,316	5,970,171
Manufactures	2,673,997	1,308,873	3,982,870
Commerce	1,181,514	308,754	1,490,268
Liberal professions	832,692	161,740	994,432
Persons living on their income	545,050	425,534	980,584
Without profession, or profession unknown	....	....	980,939

The first of the following tables shows the pop. for 1832, 1851, and 1876 of the towns in *F.* that had upwards of 50,000 inhabitants in the last-mentioned year.

	1832.	1851.	1876.
Paris	774,338	1,053,262	1,988,806
Lyons (*Fr.* Lyon)	133,715	156,169	322,612
Marseilles (*Fr.* Marseille)	145,115	185,082	234,690
Bordeaux	99,062	123,935	212,111
Lille	69,073	68,463	137,150
Toulouse	59,630	85,554	120,208
St. Etienne	... ..	53,741	117,537
Nantes	77,992	91,303	116,093
Rouen	88,086	91,512	104,893
Havre	23,816	26,410	85,407
Rheims (*Fr.* Reims)	35,971	43,643	80,098
Roubaix	......	31,038	74,946
Brest	29,860	36,492	66,828
Nancy	29,783	40,289	66,303
Amiens	45,001	49,139	61,606
Toulon	28,419	45,510	60,382
Nîmes	41,266	49 480	60,804
Angers	32,743	43,088	55,366
Limoges	27,070	37 010	55,097
Rennes	29,680	33,066	53,598
Montpellier	35,825	40,222	51,838

Towns with from 20,000 *to* 50,000 *Inhabitants in* 1876.

Orléans	49,896	Rochefort	25,454
Versailles	49,552	Laval	25,110
Tours	48,325	Perpignan	24,379
Nice	46,683	Carcassonne	23,517
Le Mans	45,709	Aix	23,407
Dijon	45,607	Douai	23,348
Grenoble	43 054	Périgueux	23,290
Besançon	42,808	Vienne	22,950
Troyes	41,275	Levallois-Perret	22,733
Boulogne (Pas de Calais)	40,075	Valenciennes	22,686
St. Quentin	37,980	St. Pierre-lès-Calais	22,349
Clermont-Ferrand	37,074	Bayonne	22,307
Béziers	36,928	Elbeuf	21,935
Cherbourg	36,338	Montluçon	21,904
Dunkirk (*Fr.* Dunkerque)	35,012	Boulogne (Seine)	21,556
Avignon	33,189	Roanne	21,472
Caen	33,072	St. Omer	21,404
Tourcoing	33,013	Moulins	21,122
Poitiers	31,692	Neuilly	20,781
Bourges	31,102	Nevers	20,601
Lorient	31,000	Châlon-sur-Saône	20,571
St Denis	29,500	Armentières	20,565
Angoulême	28,625	Castres	20,520
Cette	28,152	Valence	20,476
Pau	27,553	Niort	20,336
Arras	26,764	Châlons-sur-Marne	20,215

The surface of *F.* exhibits, in general, an advantageous succession of high and low ground. Less level than Poland, the North of Germany, or the greater part of European Russia, it is on the whole less mountainous than Spain or Italy. Passing over lofty ridges which form the frontier line of *F.* on the side of the Pyrenees, the Alps, the Jura, and the Vosges, and confining our attention to the interior, we find, throughout Flanders, Picardy, Normandy, and the countries to the N. and S of the Loire, a level tract, diversified occasionally by hills, either insulated or in succession, but by none of the massy elevations entitled to the name of mountains. These we do not meet until reaching the S of Champagne and N. of Burgundy, near the sources of the Meuse, the Moselle, the Saône, and the Seine. From this bleak quarter (lat. 47° and 48°), a very long range of mountains proceeds from N to S. in a direction parallel to the course, first of the Saône, and subsequently of the Rhône, until, on approaching the Mediterranean, they branch off to the S. W. and join the Pyrenees. Their greatest height is in Auvergne (about lat. 45°), where this chain, or more properly a lateral branch of it, attains, at the mountains called Cantal and Puy-de-Dôme, an elevation of fully 6,355 feet, and has its highest ridge covered with snow during the greater part of the year. Another, but a much less lofty range, extends from Bordeaux to the S E, a distance of 150 m., until it reaches the Pyrenees The smaller chains are numerous in the E. and S. E. of the kingdom, — in Lorraine, the Nivernois, Dauphiné, Provence: also in part of the interior, particularly the Limousin and Guienne. They are interspersed with extensive plains, but, on the whole, the S and E. of France are rugged and elevated tracts — *Rivers.* The course of the great rivers is easily connected with this view of the surface of the territory of *F.* The Moselle, the Meuse, the Marne, the Aube, the Seine, the Yonne, taking their rise on the N. side of the mountain chain, between lat. 47° and 48°, flow all to the N. or N W., until reaching the sea or quitting the territory of *F.* From the S slope of the same range proceed the Saône, the Doubs, and the Ain. These, along with many smaller streams, are all received by the Rhône, which flows almost due S., with a full and rapid current, until it reaches the Mediterranean. The Loire has much the longest course of any river in *F.* It rises to the S. of lat. 45°, flows in a N. direction above 200 m.; turns, near Orléans, to the W; is joined by the Cher, Indre, and Vienne from the S, and, after receiving the Sarthe from the N., falls into the Atlantic below Nantes. The Garonne, a river of less length of course, but of greater volume of water, descends from the French side of the Pyrenees, flows N, and after receiving from these mountains a number of tributary streams, of which the chief is the Arriège, turns to the W. near Montauban (lat. 44°), and falls into the Atlantic after being augmented by the waters of the Tarn, Aveyron, Lot, and finally the Dordogne, — all flowing from the W face of the mountains of Auvergne. *F.* has very few lakes, either in the mountainous districts of the S., or in the great levels of the N. and W. It contains, however, a number of maritime inlets, forming inland bays, and communicating with the sea only by a channel of greater or less width These occur partly in the S. W. coast, in Gascony; but more in the S. and S. E., in Languedoc and Provence. Their want of depth prevents them from serving as roadsteads for shipping, and they are useful chiefly for fishing, or for the manufacture of bay-salt — *Forests* The total extent of ground covered by wood is computed at 32,250 sq. m., about one sixth of the surface of the country. There are forests in almost every department Lower Normandy contains several of considerable extent. There is a large one at Fontainebleau, only 45 m from Paris, and a larger to the N of the Loire, in the vicinity of Orleans. The department of Ardennes and the mountainous tract that forms the boundary of France on the side of Switzerland, abound in forests. The State possesses 991,763 hectares (3,833 sq. m); 1,903,258 hectares (7,348 sq m.) belong to the *communes*, or to public institutions, and are managed by the state; the rest are private property They represent a total value of about three thousand millions of francs ($600,000,000), the annual revenue of which exceeds $7,600,000. — *Climate.* The climate of *F.* is generally temperate, but by no means uniform. The division into the north, west, south, and central regions, although it seems the most natural, does not satisfactorily correspond to the actual differences. A more convenient division is that of the following four regions or zones: the region in which the olive-tree is cultivated, which is limited by a line from Bagnères-de-Luchon (Haute-Garonne) to Die (Isère); the region of the maize, or Indian corn, from the mouth of the Gironde to Raon-L'Etape (Vosges); the region of the vine, from the mouth of the Loire to Mezières (Ardennes); and the northern region, which is characterized by the culture of the apple-tree. These limits are, however, far from being absolute; the Indian corn, for example, is successfully cultivated in Brittany, and vineyards are to be found much farther N. than the mouth of the river Loire. The N. and N. W. of *F* bear a great resemblance, both in temperature and produce, to the S. of England, rain occurring frequently, and the country being consequently fit for pasture. In the interior the rains are less frequent, but, when they occur, are far more heavy, so that there is much less difference in the annual rainfall there as compared with the rest of the country than in the number of rainy days; but, on the whole, the climate of the interior is the most pleasant in *F.*, that region being exempt equally from the oppressive heat of the S. and the frequent humidity of the N. The great current of wind which prevails in *F.* blows from W. to E. from the Atlantic, over the whole surface of the country, except the lower basin of the Rhone, where the *mistral* (a cold wind coming from the N. N. W.), the E wind, blowing from the Alps, and the S. winds, do considerable damage both to the produce of the soil and to the health of the inhabitants. Pau, Cannes, Nice, &c., in the south, are much resorted to by invalids, and by foreign families for winter-quarters.

Fig 206. — WOODEN HOUSES OF THE MIDDLE AGES (LISIEUX).

Communications. Before referring to the state of agriculture, manufactures, and commerce in *F.*, it is important to have an idea of the means of communication by which the different productive districts are connected with one another The minister of public works has the superintendence of all roads and ways, natural or artificial, by land or by water. A special department, called *Administration des Ponts et Chaussées*, assisted by a council with the minister as its president, is charged with the management of that important branch of public business; 669 engineers and inspectors, and 2,183 inferior officials, form the administrative staff. — *Roads* are either national, departmental, military, or *vicinal* (cross roads). National roads are kept up entirely at the expense of the public treasury. The departments have to provide for departmental roads and a portion of the military roads, the rest being charged on the state As to cross-roads, or *chemins vicinaux*, they depend on the ministry of the interior, and are kept up by the communes, or, when of a higher importance, by the de-

partments. At the end of 1811, 229 roads were classified as imperial roads. They extended over a length of 46,500 kilomètres (28,894 m.). In 1815, after the territory of *F.* had been brought back to its ancient limits, the length was only 27,200 kilomètres (16,901 m.); in 1873 there were 223 national roads, giving a total of 37,304 kilomètres (23,180 m.), 2,627 kilomètres (1,632 m.) of which are still paved like a street. The average breadth of that class of road is 16 mètres (52 feet 6 inches), 6 mètres for causeway, 6 for the sideways, and 4 for the ditches and embankment. Although the great extension of railways has somewhat reduced the importance of high-roads, it has been calculated that the traffic has changed very little during the last twenty years. The departmental roads are not quite so wide as the national ones, their average breadth being 12 mètres (39 feet). In 1872 their length was 46,939 kilomètres (29,167 m.). Military roads were made in the W. of *F.* after the last insurrection of Vendée. They are 28 in number, distributed in the departments of Charente-Inférieure, Ille-et-Vilaine, Loire-Inférieure, Maine-et-Loire, Mayenne, Sarthe, Deux Sèvres, and Vendée, and extend to a length of about 1,500 kilomètres (932 m.). A sum of nearly 34 millions of francs is spent yearly for the purpose of making new roads or repairing old ones. The *chemins vicinaux*, or cross-roads establishing a communication between rural places not far distant from each other, are managed by a special branch of the department of the minister of the interior; about 3,000 *agents voyers* and 42,000 *cantonniers*, or workmen, are specially charged with the duty of keeping them in repair. In 1872 these roads, divided into three classes according to their importance, were 544,390 kilomètres (338,273 m.) in length, and covered a surface of about 370,000 hectares (915,000 acres). To the very considerable resources which the communes must apply to the extension and repair of their rural roads, the government used to add a yearly grant of 11,500,000 francs; but this sum has been reduced to 5,750,000 francs since 1873. The *Annales* of the administration of the *Ponts et Chaussées* mention 1,982 large bridges, of which 79 are cast-iron. The chief are the bridge over the Gironde at Bordeaux, which has 17 arches, is 501 mètres (1,643 feet) in length, and cost 6,850,000 francs; the bridge of Cubzac, over the river Dordogne; the turning bridge of Penfeld at Brest; the bridge St Esprit, over the Rhone, with 18 arches on a length of 730 mètres (2,395 feet); those of Toulouse, Libourne, Tours, and Rouen; the new bridge (*Pont-Neuf*) and the bridge of Iéna at Paris; and the bridge of La Guillotière at Lyons. — *Railroads.* The growth of the railroad system of *F.* dates from the year 1840, previous to which there were but few lines in *F.* For a time the plan was entertained of making all the railroads which were to be built state property; but in the end it was determined, and settled by law, that the work should be left to private companies, superintended, however, and, if necessary, assisted in their operations, by the state. Under this arrangement the whole of the railroads already made, and about to be constructed, were classed under two divisions, called *ancien réseau*, or Old network, and *nouveau réseau*, or New network; the former, as implied by the name, representing the first-built main arteries of traffic, and the latter the by-roads, laid down, in most instances, with a view to public utility rather than to profit. On this account, the lines coming under the designation of New network received the grant of a state guarantee of four francs per cent interest, with 65 centimes additional for a sinking-fund, on the expended capital. The following table shows the length of railroads built each year in *F.* since 1853, and the total open for traffic on the first of January of each year: —

Years	Lines opened during the year.	Total length open at the end of the year.	Years.	Lines opened during the year.	Total length open at the end of the year.
	Km	Km.		Km.	Km.
1853	316	3,862	1866	515	13,583
1854	190	4,052	1867	953	14,536
1855	589	4,641	1868	1,193	15,729
1856	886	5,527	1869	606	16,335
1857	664	6,191	1870	795	17,130
1858	1,262	7,453	1871	665	17,750
1859	1,222	8,675	1872	672	17,665
1860	393	9,086	1873	111	17,776
1861	365	9,433	1874	763	18,539
1862	672	10,105	1875	542	19,081
1863	982	11,087	1876	721	19,802
1864	944	12,031	1877	555	20,357
1865	1,037	13,068	1878	680	21,037

It will be seen that from January 1, 1871, to January 1, 1872, the length of railways opened for traffic declined from 17,750 to 17,665 kilomètres, notwithstanding that 665 kilomètres of lines were opened in the year 1871. The deficiency was caused by the loss of Alsace-Lorraine, which necessitated the sale of 750 kilomètres of railway, belonging to the Eastern Company, to the government of imperial Germany. The chief lines, which are worked by powerful companies under the superintendence of the state are: (1) the *Chemins de fer du Nord*, which run between Paris and Soissons, Boulogne, Calais, Rouen, Amiens, etc., traverse the coal-districts of Picardy, and reach the Belgian territory at Quiévrain and at Tournay; (2) the *Chemins de fer de l'Est*, from Paris to Strasburg, Mulhouse, and Basel in Switzerland, through Alsace, with branch lines to Sedan, Metz, Luxembourg, Rheims, Sarreguemines, etc., joining Belgian and Prussian railways at several points of the frontier; (3) the *Chemins de fer de l'Ouest*, which traverse Normandy in every direction, and connect Paris with the towns of Brittany; (4) the *Chemins de fer d'Orléans*, which go to Nantes, Bordeaux, Limoges, Bourges, and Toulouse; (5) the *Chemins de fer de Paris à Lyon et à la Méditerranée*, which connect the valley of the Seine with that of the Rhône, and have branch lines to St. Étienne, Clermont-Ferrand, Grenoble, Toulon, Cette, etc., establishing regular and direct communication between France and Switzerland, — the railways of Savoy being also worked by the same company. Paris is the starting-point and the administrative centre of all these lines. Another great line worked by the *Compagnie du Midi* starts from Bordeaux, which it connects with Cette and Bayonne, with branches between Bayonne, Toulouse, and Foix, Agen and Tarbes, Toulouse and Auch, Montpellier and Milhau, etc. Through this line Spain is brought into communication with France. The capital required for the making of these railways has been calculated at not less than 10,000,000,000 francs, — which gives, for a total length of 21,987 kilomètres (13,662 m.), an average of 297,000 francs per kilomètre, or $59,400. The yearly returns of the companies show an average income of $168,000,000. By a law passed in 1878 there will be added 16,000 kilomètres (10,000 m.) of railroads before the end of the year 1888. To provide for the cost of the new network of railroads, the Chambers granted a credit of 3,000,000,000 francs, or $600,000,000. — *Navigable Rivers and Canals.* All navigable rivers are state property. A table is subjoined of the navigable rivers arranged by basins, with the length of their navigable course, and also of the canals and the small rivers which have been converted into canals. Owing to the cheap rate of transport by water, canal traffic has been but little injured by the extension of railways, this inexpensive way of conveyance being used for heavy goods whenever practicable. In 1875, 1,721,070,943 kilometric tons (about 1,748,500,000 tons avoirdupois) were carried by river and canal navigation, besides 176,551,434 cubic metres (230,933,000 cubic yards) of wood or *bois flotté*. The duties levied on these goods amounted to more than 4,177,940 francs.

Navigable Rivers.

	Kilomètres.	Miles.		Kilomètres	Miles.
ADOUR	125	78	Sèvre-Nantaise	20	12½
Midouze	43	27	Thouet	11	7
Nive	20	12½	Vienne	75	47
Gave de Pau	9	5½	MEUSE	231	143½
CHARENTE	190	118	MOSELLE	173	108
Boutonne	31	20	Meurthe	12	7½
Sèvre-Niortaise	71	44½	ORNE.		
Vendée	25	16	Touques	45	28
GIRONDE.			RHONE	546	339½
Baise	87	54½	Ain	91	56½
Dordogne	393	244½	Doubs	237	141
Garonne	396	246½	Isère	158	99
Isle	143	89	Petit-Rhône	57	35½
Lot	276	172	Saône	324	201
Tarn	147	91½	Seille	39	24½
Vezère	59	37	SEINE	459	285½
LOIRE	822	511	Aisne	59	37
Achenau	23	14	Aube	45	28
Allier	247	154	Eure	14	9
Cher	94	58½	Grand-Morin	16	10
Creuse	16	10	Marne	353	219
Layon	60	37½	Oise	55	34
Loir	116	72	Yonne	118	73½
Mayenne	134	83	VILAINE	144	89½
Oudon	19	12			
Sarthe	132	82		6960	4326

Canals.

From Aire to La Bassée	43	27	Blavet	60	37
			Bourbourg	21	13
From the Aisne to the Marne	58	36	Bourgogne	242	150½
			Briare	59	37
Ardennes	106	66	Calaisis	41	25½
From Arles to Bouc	47	29½	Centre	116	72
From Bergues to Dunkirk	8	5	From the Charente to the Seudre	32	20
Berry	322	200	Colme	38	23½

Canals. — *Continued*

Deule	65	40½	From Mons to Conde	5	3
Est	24	15	From Nantes to Brest	360	223½
Etangs	43	27	Neuffossé	18	11½
Hazebrouck	25	16	Nivernais	174	108
Ille-et-Rance	84	52	Orleans	74	46
Lateral à l'Aisne	46	28½	From the Rhone to the Rhine	190	118
Lateral à la Loire	207	128½	From Roanne to Digoin	56	35
Lateral à la Marne	67	41½	St. Quentin	97	60½
Lateral à l'Oise	29	18	Haut-Seine	44	27½
Loing	50	31	Sensée	25	16
Manicamp	5	3	Somme	156	97
From Marans to La Rochelle	24	15		3315	2060
From the Marne to the Rhine	215	134			
Haute-Marne	39	24½			

Rivers Converted into Canals.

Aa	29	18	Part of the Oise	105	65½
Escaut	63	39	Scarpe	31	19½
Leyre	18	11½			
Lys	53	33		299	185½

Agriculture. In the general description of the country, some information has been given as to the nature of the soil and its various kinds of produce, which must be supplemented here. The extent of agricultural improvement in *F.* since the first Revolution has certainly been less than in England and Scotland, and it has been repeatedly said that this inferiority had its chief cause in the insignificant size of the occupancies, a feature of French agriculture which Arthur Young observed in his time, but which has been much increased by the law obliging a father to make an almost equal division of his property amongst his children. It would be perhaps nearer the truth to say that generally the more fertile a country is the less care the inhabitants take to cultivate it; if we add to this the influence of the climate, which makes country people more frugal, and at the same time more indolent, we shall be able to account for the difference in the state of agriculture as between the N. and the S. provinces of *F.* It does not appear, however, that land thus divided produces less in proportion than large estates, and, notwithstanding the great progress that *F.* has still to make, it is in an agricultural point of view as rich as any other country. The following table, taken from official documents, exhibits the physical and agricultural division of the French territory. —

	Hectares.	Sq. Miles
Arable land	25,500,675	98,460
Forests, woods, and parks	8,800,349	33,978
Heaths and moors (lands)	7,138,282	27,551
Meadow land	5,159,179	19,920
Vineyards	2,088,048	8,062
Roads, streets, public walks, and built lands	1,331,757	5,157
Water	737,587	2,837
Orchards and gardens	627,704	2 423
Chestnut plantations	559,029	2,158
Olive, almond, and mulberry plantations	109,262	421
Miscellaneous	775,753	2,955

The *Statistique Officielle* gives a statement of the average value of land per hectare, and the average rent paid for it, distinguishing in each case three classes of land thus: (1) lands under tillage: value, 3,095, 2,175, 1,375 francs; rent, 96, 69, 45 francs; (2) meadows: value, 4,151, 3,058, 2,022 francs; rent, 152, 104, 72 francs; (3) vineyards: value, 3,561, 2,638, 1,783 francs; rent, 130, 98, 68 francs. — The value of *wood* varies from 2,877 to 1,435 francs for the forests, and from 1,081 to 689 francs for copsewoods. — The cultivation of *grain* has always been the chief business of French agriculturists. In 1876 about 15,000,000 hectares were under this crop, distributed thus: —

	Hectares.	Average Crop per Hectare	Total Produce.
		Hectolitres.	Hectolitres.
Wheat	6,963,419	12.04	83,861,193
Meslin	503,178	12.50	6,287,301
Rye	1,912,001	10.84	20,779,967
Barley	1,118,071	16.76	18,732,827
Oats	3,182,456	21.33	67,891,065
Buckwheat	677,693	14.35	9,722,257
Maize	606,963	14.72	8,918,352
Millet	49,984	12.24	612,031

Wheat sells at prices varying from 20 to 26 francs a hectolitre ($11.93 to $15.10 a quarter), and costs the agriculturist about 17 francs 50 centimes ($10.15 a quarter). The quantity which is produced in France, large as it is, does not meet the wants of the population, and several millions of hectolitres are every year imported from Russia, Roumania, Spain, Italy, Egypt, and the U. States. — The cultivation of meslin and rye is on the decline; wherever the progress of agricultural science had succeeded in making a poor soil more rich and fertile, wheat takes their place, as being better and more profitable. — The area allotted to barley has been much the same for a long period, and is likely to remain so. The same may be said of maize, which is especially cultivated in the east and southwest, and of buckwheat, which in Auvergne and Brittany forms no small part of the food of the inhabitants. Oats are extensively cultivated, and yield a good return; this crop was on the increase from 1815 to 1862, but has since been almost stationary. — *Potatoes* form a very important article, occupying in 1876, 1,176,495 hectares (2,907,290 acres), and yielding 120,410,929 hectolitres (331,274,554 bushels). — The other crops are tabulated here, with the results they yielded for 1876: —

	Hectares	Average Crop	Total.
		Hectolitres.	Hectolitres.
Pease, beans, etc.	322,681	13.74	4,434,107
Chestnuts	482,247	13.68	6,567,381
Colza and other oleaginous plants	214,808	13.34	2,863,441
Olive-trees	148,626	....	4,594,010
		Quintals	Quintals.*
Beet	253,335	306	77,435,100
Hops	3,528	14	50,244
Tobacco	14,858	12	172,522
Hemp	95,521	5.28	503,941
Flax	87,671	5.75	503,917
Miscellaneous	10,900	20	319,898

* The *quintal metrique* is 3½ lbs. less than two cwt.

Meadows, both natural and artificial, are very numerous in France, and give a higher return than any other kind of land. — The *vineyards* cover 4.27 per cent of the surface of France, and are one of the chief sources of its agricultural wealth. They are to be found, more or less, in every district, except in ten northern departments, viz.: Calvados, Côtes-du-Nord, Morbihan, Finistère, Manche, Nord, Orne, Pas-de-Calais, Seine-Inférieure, and Somme. The departments in which the vine is most extensively cultivated are, — Hérault (162,172 hectares), Charente-Inférieure (157,753), Gironde (156,220), Charente (100,000), Gers (94,790), Gard (94,200), Dordogne (87,252), Aude (81,869), Var (79,040), Lot-et-Garonne (69,166). The vintage of 1876 gave a total of about 41,846,748 hectolitres (921,033,017 gallons). It is very difficult to say to what extent the ravages of the *Phylloxera* have affected and may still further affect the production of wine either in quality or quantity. It has unquestionably had the effect of raising the price of the finer wines 25 to 35 per cent in 1879. (See BURGUNDY WINES, CHAMPAGNE, CLARET WINES, etc.) — *Live Stock.* The last census gave 2,882,851 as the total number of horses, comprising 400,154 colts, 351,054 stallions of 4 years and upwards, 872,911 geldings, and 1,257,832 mares. The number of mules was 290,129, and of asses 450,625. There were 10,023,716 head of cattle and 24,707,496 sheep. The goats, particularly numerous in Corsica and some mountainous parts, were 1,791,725. The addition of 2,500,000 beehives, of a total value of about 32,800,000 francs, 58,300,000 poultry of all kinds, and 2,500,000 dogs completes the enumeration in its principal divisions of the live stock of agricultural *F.*

Manufactures. One of the foremost branches of manufacture in France is that which has for its object the working up of textile materials. The gross amount of its produce is not less than 3,500,000,000 francs ($700,000,000) a year, and the latest statistics (published in 1873) return it as employing 398,481 men, 396,898 women, 69,948 children, 2,777 steam-engines, and about 9,500,000 spindles. These figures relate to the period between 1861 and 1865, and are certainly very much less than if the enumeration had been taken more recently. — The *flax* gathered in 1873 weighed 54,874,740 kilogrammes (1,081,270 cwt.), and represented a minimum value of 84 millions of francs; to which must be added 10,188,721 kilogrammes (200,766 cwt.) of hemp, at an average price of one franc a kilogramme. About 800,000 spindles are kept busy with this material. In this branch of trade the department of Nord ranks first. It manufactures more than one third of the total amount of linen produced. Seine, Sarthe, Maine-et-Loire, Seine-Inférieure, Calvados, Ille-et-Vilaine, Lot-et-Garonne, Indre-et-Loire, and Seine-et-Oise are, next to the department of Nord, the chief seats of this industry. — The *cotton* manufacture has its centre in Normandy. More than a third of the total produce of the French cotton-looms comes from the department of Seine-Inférieure, Nord, Vosges, Calvados, Aisne, Aube, Orne, Meuse, and

Eure have also a large share in the production of cotton yarn and cotton cloth. The department of Rhône is famous for its cotton muslins, the value of which is not less than 28 millions of francs. Meurthe produces a special kind of trimming, valued at about 3 millions of francs a year. French cotton goods cannot cope in cheapness with the English, but they are of fine quality, and on this account command a sale in the markets. In the absence of authentic documents, we may safely estimate the produce of cotton manufacture for 1878 at 500 millions of francs, and the plant engaged in the trade at 6 millions of spindles and 260 millions of looms of various kinds The loss of Alsace has been a heavy blow to the cotton-trade of France. — In the *woollen* factories 3,200,000 spindles are employed, giving work to more than 172,000 people. Wool fabrics amount in value to 1,200,000,000 francs ($240,000,000). figures which present a striking contrast to the valuation of Count Chaptal in 1812, which was not above 250 millions of francs. Large manufacturing houses are to be found especially in the departments of Ardennes (Sedan), Nord (Lille, Cambrai, etc), Marne, Eure (Louviers), Hérault; while Rhône is noted for shawls, Bouches-du-Rhône for washing and combing wool, Calvados for wool yarns, Aisne for both yarns and tissues, Aube for drapery, etc The special manufacture of Paris is that of shawls, damasks for furniture, merinos, and lighter fabrics, as gauzes, muslins, bareges, etc — The rearing of *silk-worms* and the production of *silk* can be traced far back in the industrial history of France The first Avignon pope, Clement V., is said to have introduced the first silk-worms and the first mulberry-trees (1305) This branch of industry soon assumed a national character, and all kings who, like Louis XI. and Henry IV., cared for the progress of commerce and manufactures, gave it encouragement and privileges. In 1780 France produced 6,600,000 kilogrammes of cocoons (14,549,194 lbs.), having a value of 15,500,000 francs In 1876 *F.* produced 9,871,116 kilogrammes of cocoons, which gave 636,800 kilogrammes (12,547 cwt.) of raw silk. Twenty-one departments are engaged in the rearing of silk-worms, — those which yield the largest produce being Gard, Drôme, Ardèche, Vaucluse, Bouches-du-Rhône, Var, Isère, Hérault, Basses-Alpes, etc. After having undergone the various operations which transform the cocoon into regular yarn, the silk goes to the weaver. Nine tenths of the silk is woven at Lyons, by 120,000 looms, belonging to 400 firms, who every year produce silk goods to a value of about 460 millions of francs — The manuf of *lace* gives employment to 240,000 women at Alençon, Bailleul (Valenciennes), Lille, Chantilly, Caen and Bayeux, Mirecourt, Le Puy, and Paris; and there are 150,000 *embroiderers* in the departments of the N and E. The two industries contribute to the public wealth about 90 millions of francs every year. — Paris, Grenoble, Lunéville, Vendôme, Blois, Béziers, Annonay, and Niort are the chief seats of the manuf of *gloves*, which represents a sum of about 70 millions of francs. — *Beet sugar* is extensively made in the North of France. The manuf. of this sugar in a raw state was thus distributed for the year 1876: —

	Kilogrammes.	Cwt.
Aisne	92,721,965	1,827,034
Nord	111,114,778	2,189,454
Oise	41,367,892	815,131
Pas-de-Calais	60,102,110	1,184,278
Somme	67,747,541	1,334,927
Other departments	75,817,002	1,493,931

These quantities are produced by about 510 manufactories Ninety establishments are especially engaged in refining the first produce extracted from beet-root, or from the sugar-cane; about 180,000 tons of raw sugar are received annually from the colonies, French and foreign, by these refining establishments, which employ 3,400 workers. The yearly value of the manuf. amounts to 140 millions of francs. — *Liquors.* Wine, treacle, and the juice of the beet-root are the substances from which the largest quantity of the alcohol produced in France is extracted About 3,500 firms are engaged in distillation; the produce for the year 1876 was divided thus: —

	Hectolitres.	Gallons.
Alcohol distilled from wine	415,967	9,155,295
" " corn and potatoes	97,467	2,145,217
" " beet-root	315,024	6,933,572
" " treacle	681,734	15,004,739
" " other substances	48,017	1,056,838
Total	1,558,209	34,295,661

Normandy and Brittany are the chief centres for the production of *cider.* In 1876 about 7,035,669 hectolitres (154,845,539 gallons) were manufactured. There are about 3,200 brewers, who send out not less than 7,400,000 hectolitres of *beer* (162,871,543 gallons), worth about 200 millions of francs; but, as hops are but little cultivated in *F*, 3 millions of francs are spent yearly in importing them The largest manufactories of *vinegar* are in the departments of Loiret and Loire-Inférieure; it is made almost exclusively from wine, but malt and some other substances are now beginning to be used. The total value is about 3 millions of francs. — The principal *soap* manufactories are at Marseilles, its production being 800,000 quintals (1,576,354 cwt.); Nantes and Paris hold the second rank. It has been calculated that *F.* produces annually 2 millions of quintals (3,940,886 cwt) of soap. *Candles* are chiefly made at Paris. This branch of manufacture has a total value of 300 millions of francs, whilst the production of soap amounts to 450 millions. French *perfumery* is appreciated through the world, and gives a yearly return of more than 50 millions of francs. — *Pottery and Glass.* The departments of Vienne, Seine, Sarthe, and Puy-de-Dôme are the centres of the fabrication of earthenware and bricks; in Haute-Vienne, Var, and Gironde the special manufacture is china. The annual produce of this industry is valued at 150 millions of francs A great manufactory kept up by the state at Sèvres forms a school in which artistic workmen are trained, so that the art is maintained in a high degree of perfection. Crystal wares are made in eight works established in the departments of the Meurthe-et-Moselle, Seine, and Orne, among which special mention must be made of Baccarat, which is to this branch of industry what Sèvres is to the ceramic. Looking glasses are a very important article of manuf in *F*, that country possessing no fewer than 6 out of the 15 or 16 establishments in Europe. The principal manufactory is at St. Gobain (Aisne), and the value of the produce of the whole is above 14 millions of francs. Glass of a more common kind is made in about 250 establishments, and is valued at 80 millions of francs. The departments of Nord, Haute-Saône, Haute-Loire, Allier, Seine-Inférieure, Seine, Aveyron, and Loire are famed for common window and plate glass; bottles are chiefly manuf. in the department of Nord, and in the basins of the Loire and Rhône. — The most important paper-mills are situated in Charente, Pas-de-Calais, Seine-et-Oise, Isère, Vosges, Seine-Inférieure, Seine, Eure, and Seine-et-Marne. Paris is celebrated for its *paper-hangings* and stained paper. The produce of this manufacture is valued at 75 millions of francs. — *Coal and Iron.* The principal mines which *F.* possesses are coal and iron mines. Coal-pits are almost exclusively confined to the east, southeast, and north of the country. The richest departments are Nord (239 square miles), Pas-de-Calais (201), Gard (187), Saône-et-Loire (165), Hérault (113), Loire (110), and Bouches-du-Rhône (107). The whole area is about 2,200 square miles, and comprises 123 separate *concessions*, which, however, are not all being worked. The yield of coal-mines in 1876 was 170,477,613 quintals (16,795,824 tons), the following being the most productive districts. —

Names of the Basins.	Departments.	Quintals.
Valenciennes	Nord, Pas de Calais	65,332,909
Loire	Loire, Rhône	34,717,183
Alais	Ardèche-Gard	16,448,387
Creuzot, Blanzy	Saône-et-Loire	9,905,876
Commentry	Allier	9,219,227
Aubin	Aveyron	7,046,129
Aix	Bouches-du-Rhône, Var.	3,545,100
Graissessac	Hérault	2,757,831
Carmaux	Tarn	2,571,700
Ahun	Creuse	2,150,828
Brassac	Haute-Loire, Puy-de-Dôme	2,020,896
Ronchamp	Haute-Saône	1,998,332
St. Eloy	Puy-de-Dôme	1,772,765
Decize	Nièvre	1,626,430
Épinac	Saône-et-Loire	1,490,170
Le Maine	Mayenne, Sarthe	1,190,680
Le Drac	Isère	1,086,520
Hardinghem	Pas-de-Calais	942,734
Basse-Loire	Loire-Inférieure, Maine-et-Loire	680,293
Vouvant, Chantounay	Deux-Sèvres, Vendée	445,819
Buxière-la-Grue	Allier	437,282
Manosque	Basses-Alpes, Vaucluse	388,054
Bert	Allier	358,145
Sainte-Foy-l'Argentière	Rhône	332,103
Maurienne-Tarentaise, Briançon	Hautes-Alpes, Savoie	299,690

France is very rich in iron-mines; but as these are generally far from the districts which produce coal, the working expenses are considerably increased, and sometimes to such an extent that the metal extracted cannot repay the outlay required for its extraction, and the mines have to be abandoned The production of iron, however, is on the increase, and reaches 7½ millions of quintals (738,915 tons), which represent about 14,500,000 quintals (1,428,571 tons) of pig-iron. — *Gold and Silver Work.* Paris is the chief centre of the manuf. of artis-

tic objects in gold and silver. In 1876 the workmen were 19,278 in number, distributed among 4,072 establishments, and the business was transacted to the value of not far from 250 millions of francs. Lyons holds the second place, and then Bordeaux, Marseilles, Nimes, Besançon, Clermont-Ferrand, and Toulouse. — The manufacture of *watches and clocks* yields a revenue of 30 millions of francs. Large iron clocks are made at Morez (Jura); time-pieces are constructed in part at St. Nicolas d'Aliermont (Seine-Inférieure) and at Montbéliard, and finished at Paris; watches are begun at Montbéliard and Cluses (Haute-Savoie), and finished at Paris and Besançon. This last town is the central place of the trade, and represents 93½ per cent of the total manufacture: 15,000 persons, men, women, and children, are employed in this trade, and in 1876 they turned out 146,381 gold and 274,811 silver watches.

The chief commercial business of Paris is necessarily inland; but it is the centre of exchange transactions for *F.*, foreign as well as inland, as London is for England. Havre de Grace is the channel for the maritime intercourse of the capital, the outlet for its exports, and the medium through which it receives colonial produce, raw materials, and foreign manufactures.

The *inland trade* is greatly more important than the foreign trade. It is impossible to give a strict and correct valuation of the inland traffic, but judging of the whole from the few accessible details, we may, without exaggeration, estimate its amount at about 40 milliards of francs ($8,000,000,000).

The *coasting trade* has always been of great importance in *F.* In 1875 the total weight of goods transported by coasters was 2,022,559 tons, an increase of nearly 7,000 tons on the preceding year. These goods were of various kinds, — building materials (258,174 tons), wines (225,595 tons), salt (213 185 tons), wood (207,211 tons), corn and flour (199,461 tons), coals (125,243 tons), being the chief articles in the general traffic. 62,396 vessels, the tonnage of which amounted to 3,207,933 tons, were engaged in this trade, while in 1874 there were only 57,888, of 2,952,414 tons. The harbors most frequented by coasters are Marseilles, Le Havre, Bordeaux, Dunkirk, Rouen, Cettes, Dieppe, Nantes, St. Nazaire, and Boulogne.

Fisheries. The annual produce of river and pond fishing in the interior of *F.* may be valued at about 10 millions of francs. Coast-fishing was carried on in 1871 by 8,995 boats, manned by 38,150 men, with a tonnage of 68,517 tons, giving a return of 51,000,200 francs. In 1875 the increase was considerable, the number of the boats being 20,159, the tonnage 101,852 tons, the crews 68,651 hands, and the revenue 61,780,100 francs. The same year 178 vessels, with a tonnage of 30,295 tons, and manned by 7,800 men, sailed from French ports to fish for cod on the coasts of Newfoundland. The average value of the Newfoundland fisheries is estimated at about 17 millions of francs. The rearing of oysters has of late made very great progress in *F.* Large beds are established on almost every suitable point of the coast, as at Cancale, Auray, Marennes, Oleron, and Arcachon. The last-named place is the most important of all, the beds being not fewer than 2,427, which gave for 1876 a return of 3,941,309 francs, represented by 196,885,450 oysters.

Foreign Trade. Although the principles of free trade are now better understood in *F.* than they were formerly, and are generally considered by French economists and statesmen as most conducive to the interests of a nation, their application is still far from complete, owing to the enormous charges brought upon the country by the late war, but chiefly to the personal influence of M. Thiers, the first president of the republic, who was a determined upholder of protection. This is not the place to enter on any discussion of the merits of the two opposite doctrines; but the fact does not admit of question that, notwithstanding the tax on raw materials and other duties which hamper the commercial intercourse of *F.* with other nations, her foreign trade has been constantly increasing. The foreign trade of *F.* is divided into *commerce général*, which comprises the entirety of imports and exports, including goods in transit and precious metals, and *commerce special*, which embraces the imports consumed within, and the exports produced within the country. The general commerce of the year 1878 was valued in imports at 4,350,000,000 francs ($870,000,000), and the exports at 4,820,000,000, ($964,000,000). The following tables give the value, in francs, of the special commerce of *F.* with foreign countries in the years 1874, 1875, and 1876: —

COUNTRIES.	IMPORTS.			EXPORTS.		
	1874.	1875.	1876.	1874	1875	1876
Great Britain	591,700,000	624,300,000	649,900,000	987,100,000	1,067,200,000	1,033,200,000
Belgium	409,300,000	439,100,000	403,500,000	523,500,000	527,200,000	445,700,000
Italy	288,900,000	322,500,000	415,400,000	204,200,000	218,700,000	215,800,000
Germany	315,500,000	349,000,000	389,000,000	413,000,000	426,900,000	431,200,000
Switzerland	94,200,000	83,700,000	110,100,000	299,700,000	315,200,000	279,000,000
Spain	129,900,000	94,100,000	96,100,000	130,200,000	140,600,000	154,500,000
Russia	183,200,000	196,500,000	176,400,000	35,100,000	47,300,000	34,600,000
Sweden, Norway, and Denmark	69,500,000	67,600,000	89,800,000	28,200,000	30,800,000	31,400,000
Netherlands	30,100,000	33,200,000	30,600,000	34,500,000	50,200,000	41,100,000
Portugal	12,400,000	8,000,000	11,900,000	21,100,000	25,400,000	25,600,000
Austro-Hungary	66,200,000	57,900,000	68,400,000	15,300,000	21,400,000	17,100,000
Turkey	170,800,000	122,500,000	187,700,000	82,000,000	75,000,000	46,500,000
Greece, Malta, and Gibraltar	9,300,000	8,100,000	6,800,000	20,900,000	24,400,000	18,800,000
United States	211,500,000	190,200,000	264,500,000	293,400,000	264,400,000	229,000,000
Mexico	6,700,000	9,100,000	8,000,000	16,400,000	17,000,000	11,500,000
Brazil	48,100,000	50,500,000	55,300,000	67,500,000	73,200,000	81,400,000
Chili	23,600,000	14,000,000	26,900,000	37,900,000	31,200,000	28,400,000
Peru	51,300,000	51,000,000	59,300,000	25,400,000	23,800,000	17,100,000
Other countries in America	215,000,000	236,300,000	245,000,000	162,700,000	184,800,000	152,300,000
British India	101,600,000	120,500,000	139,400,000	5,400,000	8,200,000	6,400,000
China	75,500,000	88,000,000	140,800,000	1,000,000	3,200,000	3,400,000
Japan	19,900,000	15,900,000	36,000,000	8,100,000	11,800,000	9,200,000
Cochin-China and Siam	5,400,000	3,600,000	2,900,000	4,600,000	5,000,000	4,300,000
Dutch Indies	7,300,000	10,200,000	12,700,000	2,200,000	3,800,000	4,000,000
Africa	116,900,000	105,000,000	126,400,000	71,300,000	71,400,000	51,100,000
Other countries	1,900,000	600,000	1,700,000	7,300,000	3,900,000	6,400,000
Total foreign countries	3,201,700,000	3,321,000,000	3,765,300,000	3,512,200,000	3,673,200,000	3,379,600,000

Commerce of France with its Colonies during the same Period.

COLONIES	IMPORTS			EXPORTS.		
	1874	1875.	1876	1874.	1875	1876
Algeria	112,900,000	108,600,000	122,600,000	135,000,000	116,100,000	118,500,000
Senegambia	11,000,000	9,600,000	9,200,000	4,600,000	4,800,000	4,800,000
Réunion	23,300,000	20,000,000	23,100,000	10,900,000	8,300,000	8,600,000
St. Pierre and Miquelon	25,500,000	24,300,000	26,300,000	7,000,000	6,200,000	5,900,000
Martinique	21,500,000	23,900,000	20,500,000	13,100,000	15,400,000	11,100,000
Guadeloupe	15,300,000	17,800,000	15,300,000	12,200,000	12,200,000	10,100,000
French Guiana	500,000	300,000	300,000	4,400,000	5,200,000	5,000,000
Possessions in India	3,100,000	7,800,000	4,000,000	700,000	900,000	800,000
Ste.-Marie, Mayotte	2,300,000	1,700,000	1,800,000	400,000	300,000	300,000
Total French colonies	216,000,000	215,000,000	223,100,000	188,900,000	190,400,000	196,000,000

The following statement shows the value of the four groups of imports and of the three groups of exports, according to the classification adopted by the French Douane, or Custom House, in each of the years 1876 and 1877 : —

IMPORTS.	1876.	1877.
	Francs.	Francs.
Articles of food	972,960,000	957,668,000
Raw materials	2,367,833,000	2,154,067,000
Manufactures	463,405,000	450,456,000
Other articles	184,165,000	194,177,000
Total	3,988,363,000 $797,672,600	3,756,368,000 $751,273,600
EXPORTS.		
Manufactures	1,894,268,000	1,846,093,000
Articles of food and raw materials.	1,487,716,000	1,448,736,000
Other articles	193,610,000	189,494,000
Total	3,575,594,000 $755,118,800	3,484,323,000 $696,865,000

The imports of coin and bullion — not included here were of the value of 812,215,000 francs ($162,443,000), and the exports of the value of 157,995,000 francs ($31,599,000). — The foreign trade is for a great part carried on by sea. *F.*, however, has a very limited number of trading vessels; and foreign ships, chiefly English, convey about two-thirds of her goods, both imports and exports. The number of laden vessels entered and cleared in 1876 was as follows : —

Nationality.	Total.		Steamers.	
	Vessels.	Tons.	Vessels.	Tons.
French	18,170	5,072,000	6,218	3,495,000
Foreign	35,952	9,062,000	16,953	6,276,000
Total	54,122	14,134,000	23,171	9.771,000

The commercial navy, in 1877, was as follows : —

Class of Vessels.	Vessels.	Tons.	Crews.
Sailing vessels	14,861	792,836	84,801
Steamers	546	218,449	10,237
or,			
For port service	498	9,631	2,090
Fishing vessels	9,590	133,521	53,077
Coasting vessels	2,604	116,925	10,336
Long-voyage vessels	2,328	728,530	29,218
Vessels out of use or probably lost	387	22,678	409
Total 1877	15,407	1,011,285	95,138
" 1876	15,441	1,028,228	96,164
" 1875	15,524	1,037,272	98,022

Commerce with the U. States. A "Convention of Navigation and Commerce," signed by the plenipotentiaries of the two powers on the 24th of June, 1822, and ratified and declared in operation by the U States on the 12th of February, 1823. provides that articles, the growth, produce, or manufacture of the U. States, when exported to *F.* in vessels of the U. States, shall pay an additional duty not exceeding 20 francs ($3.75) per ton of merchandise, over and above the duties paid on the like articles exported to *F.* in French vessels; that articles, the growth, produce, or manufacture of *F*, imported into the U. States in French vessels, shall pay an additional duty not exceeding $3.75 per ton of merchandise, over and above the duties paid on like articles imported in vessels of the U. States; that no discriminating duties shall be levied upon the productions of *F.* imported in French bottoms into our ports for re-exportation; that a like advantage shall be given, and is given, to the U. States; that the following quantities shall be considered a ton for the articles specified, viz.: Four 61 gallon hogsheads, or 244 gallons of 231 cubic inches of wine, American measure; 244 gallons of brandies and all other liquors; 50 cubic feet of silk, American measure, in the U. States; and 42 cubic feet, French measure, in *F.*; 804 pounds avoirdupois of cotton; 1,600 pounds avoirdupois of tobacco; 2,240 pounds avoirdupois of pot and pearl-ashes; 1,600 pounds avoirdupois of rice; and for all weighable articles not specified, 2,240 pounds avoirdupois; that the duties of tonnage, light-money, pilotage, port charges, brokerage, and all other duties on foreign shipping, over and above those paid by the national shipping in the two countries. other than those above specified, shall not exceed, in *F.*, for vessels of the U. States, 5 francs (94 cents) per ton of the vessel's American register, nor for vessels of *F.* in the U. States 94 cents per ton of the vessel's French passport; that the convention shall remain in force two years from the 1st of October, 1822, and after that time until the conclusion of a definite treaty, or until one of the parties shall have declared its intention to renounce it, which declaration shall precede the renunciation six months Several conventions of limited duration have since slightly modified the convention of 1822, which, however, has not been annulled. The trade between the U. States and *F* is therefore still substantially regulated by the convention of 1822, and guarded by the powers and privileges secured to the consuls of each nation by the consular convention of February 28, 1853. In 1878 the Chamber of Commerce of New York sent a committee to represent it at a Congress held in Paris to consider the provisions of a treaty of commerce between *F.* and the U. States. Later, M. Leon Chotteau, delegate of the French National Board of Trade, who had been active in the presentation of the subject before the commercial institutions of the U. States, revisited America with the bulletins issued by the French Association to promote a treaty. M Chotteau presented his views at the Chamber of Commerce of New York at its meeting of March, 1879, whereupon a Special Committee was appointed to inquire into and report on the subject. No further action of any definite shape was taken on the subject, upon which there was and still exists considerable difference of opinion in this country.

The subjoined tabular statement shows the declared value of the total exports sent from *F.* to the U. States, and of the total imports of American produce and manufactures into *F.*, in each of the 20 years from 1859 to 1878: —

Year ended June 30.	Imports from United States to France.		Total Exports.	Exports from France to United States.	Total Imports and Exports.
	Domestic.	Foreign.			
1859	$43,031,473	$1.268,145	$44 299,618	$41.301,147	$85,600.765
1860	59,048,231	3,158,047	62.206,278	43.219,549	105,425,827
1861	22,786,040	1,471,803	24,257.843	34.245,549	58,503.392
1862	20,014,181	554.332	20.568,513	7,835,466	28,403.979
1863	16,530,726	619,573	17,150,299	10,591,624	27,741.923
1864	16,779,341	714.852	17.494.193	11,479,627	28,973,820
1865	13,877,186	1,031.916	14.909.102	6.688,662	21.597.764
1866	61,183.305	662,144	61,845,449	22.930.289	84.775,738
1867	44,090,831	1,806,016	45 896.847	31.208,734	77.105,581
1868	45,945,864	1,985,021	47.930,885	26.921,951	74.852,836
1869	42,450,139	1,421.537	43.871,676	35.638,324	79,510,000
1870	53,337,279	1,497,330	54.834.609	48,087,410	102,922,019
1871	27,117,512	267,703	27,385,215	28,103,025	55,488,240
1872	31.752,011	541,812	32,293.823	43.164,206	75.458.029
1873	33,637,270	575.286	34.212.556	33.977.524	68.190.080
1874	48,729,429	739,024	49,468.453	51.771,109	101.239.562
1875	50,133,711	620,200	50.753,911	63,342,631	114.096,542
1876	45.993.647	876,048	46.869,695	51,507,064	98,376,759
1877	46,233,793	1,464,275	47,698.068	50,355,540	98.053.608
1878	56,101,999	1,368,108	57,470,107	44,033,048	*101,503,155
Total	$778,773,968	$22,643,172	$801,417,140	$686,402,479	$1,487,819,619

* 8.61 per cent of the total foreign commerce of the U. States for that year.

The following table gives the declared value, in dollars, of the principal articles exported from *F.* to the U. States during the year 1878: —

Free of Duty.		Metals and compositions	316,620
Argols	1,054,322	Musical instruments	63,134
Cocoa	20,998	Oil, olive (salad)	285,898
		" volatile	21,062
Dutiable.		Paintings, etc.	310,894
Books and engravings	120,536	Paints	122,350
		Paper (hangings)	38,082
Brass (manufac. of)	87,717	Paper (manufac. of)	131,950
Breadstuffs	70,000	Perfumery	178,510
Bristles	54,191	Precious stones	1,381,886
Buttons of all kinds	1,136,392	Provisions (meats, cheese, etc.)	107,806
Chemicals, drugs, etc.	495,751		
Clothing	219,692	Salt	30,732
Cotton (manufac. of)	1,881,647	Seeds	28,209
China-ware	531,382	Silk (manufac. of)	10,891,287
Fancy goods	1,576,518	Straw (manufac. of)	855,040
Fish (sardines)	587,834	Watches	158,636
Flax (manufac. of)	451,079	Spirits and cordials	806,444
Fruits and nuts	658,974	Wine	2,450,059
Furs	719,404	Wood (Cabinet-ware, etc.)	110,157
Glass and glass-ware	318,247		
Hair (human)	29,947	Wool	105,390
India-rubber (manufactures of)	26,289	" cloths and cassimeres	1,321,243
Iron (pig)	169,531	" shawls	428,106
" machinery	32,681	" dress-goods	4,232,783
" other manufac. of	157,930	" hosiery, etc.	1,020,753
Jewelry	91,139	All other articles	4,408,034
Leather	2,461,633		
" gloves, etc.	1,309,173		44,033,048

The following table exhibits the declared value of the principal articles of American produce and manufactures imported from the U. States to *F.* during the year 1878.

Agricultural implements	641,484	Oil, lard	108,871
Horned cattle	35,700	" fish	190,750
Ashes (pot and pearl)	29,720	" cotton-seed	609,195
Bark for tanning	22,190	Paintings and engravings	56,120
Brass goods	55,885	Bacon and hams	4,161,468
Indian corn	1,552,109	Beef, salted or cured	20,693
Books	25,779	" fresh	42,537
Oats	280,478	Fish, cured	20,381
Wheat	5,801,914	Lard	4,274,074
Carriages (parts of)	21,905	Meat, preserved	65,069
Copper	1,614,100	Pork	42,523
Cotton	25,964,493	Sewing machines	41,135
Drugs, chemicals, etc.	59,675	Spirits from grain	389,900
Fancy articles	68,230	Tallow	1,503,502
Gold and silver	1,811,481	Tobacco (leaf)	2,283,512
" " (manufactures of)	22,255	Watches	41,350
		Wearing apparel	28,731
Hemp (manufac. of)	55,838	Whalebone	91,019
Hides and skins	232,120	Wood, and manufactures of	657,122
Iron (machinery)	73,785		
Resin and turpentine	43,550	All other articles, each under $20,000	685,622
Mineral oil, crude	1,938,095		
" " refined	394,444		$59,101,909

In 1878, 174 American vessels (tonnage 119,212) entered, and 123 (tonnage 80,233) cleared the French ports.

Finances. The total income of the public treasury in *F.*, including the revenues of the departments and communes, is above 3,000,000,000 francs ($600,000,000), which is more than any other nation has to pay for the expenses of its government; and yet this enormous sum has not been sufficient to meet the wants of the state, for repeated loans have constantly increased the public debt. Not taking into account the petty payments of all sorts that government has always to make, the public debt is divided into funded (*dette consolidée*) and floating debt (*dette flottante*). The funded debt is not subject to reimbursement, but only to the payment of a certain interest fixed by law. This debt, which was arranged by the law of the 9th of Vendémiaire year VI (27th September, 1797), to liquidate the old debts of the monarchy, then amounted to 40,216,000 francs of interest to be paid yearly to the creditors. From 1800 to 1814 it increased by 23,091,635 francs, and the Government of the Restoration added 101,290,463 francs, making a total of 164,598,100 francs in interest. Louis Philippe carried it to 176,845,317 francs, and at the time of the *coup d'état*, it amounted to 230,768,863 francs. The second empire, during a period of eighteen years, created 168,187,663 francs of consols, thus charging *F.* with an annual payment of 398,956,526 francs. As an unavoidable consequence of the Prussian War, the funded debt has been still further increased, so that the interest was 748,593,642 francs in 1874, and 747,571,030 francs in 1877, which gives an average of about 21 francs per head of the population. — The floating debt, which the government contracts either by receiving private deposits and using them for its needs or by issuing bills of exchange called *bons du trésor*, amounted in 1872 to 761,000,000 francs. This part of the public debt, including some other items under the name of *capitaux remboursables à divers titres*, appears in the budget of 1877 for the much lower figure of 300,226,686 francs ($60,045,337).

The principal sources of revenue and branches of expenditure in the budget estimates for each of the two years 1877 and 1878 were as follows: —

Revenue.	1877.	1878.
	Francs	Francs
Direct taxes	388,179,000	392,114,000
Special taxes assimilated to direct taxes	24,291,000	25,615,800
Produce of domains	13,986,451	14,970,000
Produce of forests	38,548,680	38,072,600
Registration duties and stamps	620,619,000	623,070,000
Customs and salt	273,730,000	283,020,000
Indirect taxes	1,040,767,000	1,056,628,000
Posts	116,126,000	113,876,000
Tax on personal property *Impôt de 3 p. %*	35,676,000	34,972,000
Produce of telegraphs	16,020,000	18,311,260
Universities *Produits universitaires*	4,471,670	5,093,010
Revenue of Algeria	24,483,400	25,891,400
Tax upon civil pensions	18,044,000	18,378,100
Various receipts	53,117,730	64,512,552
Produce of prisoners' work	...	5,880,000
Ressources extraordinaires	3,500,000	73,023,182
Total revenue	2,672,140,530 $534,428,106	2,793,177,804 $558,635,561
Expenditure.		
Public debt and dotations	1,201,428,330	1,221,700,729
Ministry of justice	34,338,240	34,415,740
" foreign affairs	13,201,500	12,719,800
" the interior	82,188,761	83,728,986
Service of Algeria	25,111,472	25,717,896
Ministry of finance	20,474,922	20,368,442
" war	535,073,385	538,326,499
" marine and colonies	185,975,023	193,152,491
" public instruction, worship, and fine arts	104,209,182	114,864,239
" agriculture and commerce	19,347,100	42,556,039
" public works, — ordinary service	94,184,895	78,609,079
" extraordinary service	80,000,000	156,052,507
Cost of collecting the revenue	251,616,941	241,062,678
Drawbacks and restitutions	19,557,000	17,021,000
Total expenditure	2,667,296,751 $533,459,350	2,781,035,095 $556,207,019

All the departments of *F.*, as well as many of the great cities, have their own budgets and debts, which latter were largely increased by the war. The budget estimates of the city of Paris for each of the years 1877 and 1878 were as follows:

Revenue.	1877.	1878.
	Francs.	Francs.
Ordinary receipts	213,848,276	218,645,495
Extraordinary receipts	57,495,934	35,417,840
Total revenue	271,345,210 $54,269,042	254,063,335 $50,812,667
Expenditure.		
Ordinary expenditure	211,848,277	217,607,285
Extraordinary expenditure	59,496,933	36,456,050
Total expenditure	271,345,210 $54,269,042	254,063,335 $50,812,667

The principal source of revenue in the budget of the city of Paris is from tolls upon articles of general consumption, called *droits d'octroi*, which were calculated to produce 122,203,250 francs in the year 1878. The principal branch of expenditure is for interest and sinking fund of the municipal debt, set down at 106,577,211 francs in the budget for 1878. The nominal capital of the debt of the city of Paris at the end of September, 1878, amounted to 1,970,000,000 francs, or $394,000,000. To this was added a loan of 325,000,000 francs, or $65,000,000, issued in December, 1878, and raising the total debt to 2,295,000,000 francs, or $459,000,000.

Banks. Besides the two banking companies especially founded with a view to assist agriculture, of which notice has been taken under that heading (*crédit foncier, crédit mobilier*), there are other establishments of credit which partake of the nature of public institutions, and must not be passed over in silence when speaking of French trade. The first of them is the *Banque de France*, founded in the year VII. (1799), and definitely organized by the law of April 26, 1806, which gives the management of the bank to a governor and two deputy-governors appointed by the chief of the state, and assisted by a council of fifteen *régents* and three *censeurs* elected by the shareholders. The capital of the Bank of *F.* is 182,500,000 francs. Besides issuing bank-notes, which circulate as freely as gold, the bank has the power to discount bills and letters of exchange at three months, when endorsed by three signatures; to collect bills payable given to it by private persons or commercial houses for that purpose; to receive deposits and open current accounts; and to keep in trust the coupons, deeds, silver and gold bars, bullion, and jewels which may be intrusted to it, at the rate of one per cent per annum. The Bank of *F.* has now a branch in each department. In

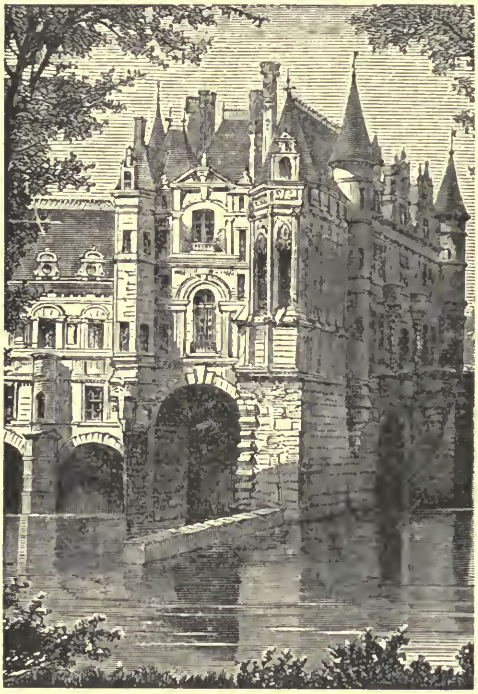


Fig. 207. — Château de Chenonceaux.

the following towns, Bourg, Cahors, Tarbes, Aurillac, Mende, Tulle, Digne, Belfort, Foix, Gap, Mont-de-Marsan, La Roche-sur-Yon, and Meaux, these branches are not yet open; but the law has been passed, and their being opened is only a question of time. This establishment is the great instrument of credit in the country. It has more than once supported the government by loans in difficult circumstances. The government, which holds a great number of its shares, is therefore interested in its preservation, and, when money is unusually scarce, gives to its notes the value and privileges of coin, by decreeing what is called the *cours forcé*. This measure was resorted to during the late war, and confidence in the bank remained unshaken. During the year 1876 the quotation of the shares of the Bank of *F.* fluctuated between 3,875 and 3,470 francs. Of other banks the *Comptoir d'Escompte*, which dates from 1848 and was reorganized in 1854, the *Société générale de Crédit industriel et commercial*, founded in 1859 after the model of the London joint-stock banks, the *Société générale pour favoriser le développement du Commerce et de l'Industrie en France*, established in 1864, whose special feature is to endeavor to make use of checks popular in F., and the *Caisse des Dépôts et Comptes-courants*, are also worth mentioning. Among the local banks, the *Crédit Lyonnais*, the *Banque Parisienne*, the Colonial Banks, and the Bank of Algeria may be named as the most important.

Coinage. The coining of money is carried on by private contractors under the strict superintendence of the state. There are now in *F.* six *hôtels des monnaies* (mints), in Marseilles, Bordeaux, Lille, Lyons, Paris, and Rouen respectively. Paris is the chief centre, and the other mints hardly now issue anything except copper coins. From 1795 till the 1st of January, 1874, the quantity of gold and silver moneys coined in *F.* was as stated below: —

Gold.

	Francs.
Coins of 100 francs	44.346.400
" 50 "	46.568.700
" 40 "	204.432.360
" 20 "	6.273.174.360
" 10 "	965,051,690
" 5 "	210,947,190
	7.744.520.700
	or, $1,548,904,140

Silver.

	1795–1871.	1872.	1873.
	Francs	Francs.	Francs.
Coins of 5 francs	4,685.641.250	389.190	154.649.045
" 2 "	70.512.344	7,547.588	1,056 152
" 1 "	86.998.118	15.958 333	19 101
" 0.50 centimes	40.480,856	2,943,258	545,862
" 0.20 "	2,504,728		
	4,886,137.296	26,838,369	156,270,160
	Total, 5,069.245.825 francs, or, $1,013,849,165.		

This amount (with 307,232,889 francs value recoined) is apportioned thus among the different governments which have ruled *F.* during the period specified: —

	Gold.	Silver.	Total.
	Francs.	Francs.	Francs.
First Republic	....	106,237,255	106,237,255
Bonaparte and Napoleon I.	528.024.440	887,830,055	1,415,854,495
Louis XVIII.	389,333 060	614.830,110	1,004,163.170
Charles X.	52.918.920	632 511.320	685.430,240
Louis Philippe	215 912.800	1,756.938.333	1,972.851.133
Second Republic.	427,282,860	459,248,282	886,531,142
Louis Bonaparte and Napoleon III.	6,151.961.600	626.294 792	6,778.256,392
Third Republic	50,169,880	221,505,707	271,675,587
Total	7.815.603.560	5 305.395,854	13,120.999,414
	$1,563,122,712	$1,061,079,170	$2,624,199,883

Money is reckoned by the franc of 100 centimes, in value 19.3 cents.

Weights and Measures. The basis of all French measurements is the *mètre* (see Metric System). The measures in common use are here given, with their English equivalents: —

Gramme	=	15.434 grains troy, or about 30 grammes equal to an ounce.
Kilogramme	=	2.205 lbs. avoirdupois.
Quintal Métrique	=	220 " "
Tonneau	=	2200 " "
Litre, Liquid Measure	=	1 76 Imperial pints.
Hectolitre { Liquid Measure	=	22 " gallons.
Hectolitre { Dry Measure	=	2 75 " bushels.
Mètre	=	3 28 feet or 39.37 inches.
Kilomètre	=	1093 yards, or nearly 5 furlongs, or ⅝ mile.
Mètre Cube } *Stère* }	=	35.31 cubic feet.
Hectare	=	2.47 acres.
Kilomètre Carré	=	247 acres, or 2⅗ K. C. to 1 sq mile.

Colonies. The colonies of *F.*, an account of which will be found under the particular headings, are, — in *Asia*, Pondichéry, Karikal, Mahé, Yanaon, Chandernagor, and Surate, and the French Cochin-China; in *Africa*, Senegal, with the island of Gorée, the island of Réunion or Bourbon, the islands of Sainte-Marie de Madagascar, Mayotte, and Nossi-Bé, in *America*, Martinique, Guadeloupe, St. Barthélemy, French Guiana, and the islands of St. Pierre and Miquelon; in *Oceania*, the Marquesas Islands, Tahiti, and New Caledonia. Among these settlements, Martinique, Guadeloupe, La Réunion, Cochin-China, and Guiana are, properly speaking, the only colonies, the rest being rather mercantile stations, except perhaps the French possessions near Madagascar and in the Pacific Ocean,

which have better prospects, and one of which, New Caledonia, now contains the principal penitentiary establishments maintained abroad by *F*. All these colonies submitted, till 1861, to what was called the colonial pact, which bound them to *F* so closely and jealously that they could trade with no other nation than the mother-country. This state of affairs has been greatly changed, chiefly for Martinique, Guadeloupe, and La Reunion; and but for some privileges of navigation and some special taxes, trade with the colonies is almost as free as trade with *F* itself. — In the above list is not included Algeria, which has a government and laws distinct from the other colonial possessions, being looked upon, partly from its proximity to *F.*, and partly from serving as camp and practice-field of a large portion of the standing army, as a more immediate annex of the mother-country.

Seaports. *F* is but very inadequately provided with harbors, her long tract of coast washed by the Atlantic and the Bay of Biscay has scarcely three or four good seaports, and those on the southern shore of the Channel form a striking contrast to the spacious maritime inlets on the English side. To begin from the N. E., *Dunkirk* has a small harbor enlarged, however, by docks, and approached in the Dutch manner, by a canal leading from the sea. *Calais*, one of the best ports on the coast, is not to be compared with Dover. *Boulogne* has a roadstead, which has been of late greatly deepened and improved. The port of *Dieppe* is exposed, and of course unsuitable for winter. The best mercantile harbor in the N. of *F.*, *Le Hâvre*, at the mouth of the Seine, has large basins and docks, formed at a very great expense. *Cherbourg* is now a port and arsenal of great utility and importance to the navy. *St. Malo*, on the N. coast of Brittany, possesses a good and large harbor, with quays extending to a length of 2,955 mètres (3,231 yards), its entrance is protected by fortified islets. Brittany also possesses *Brest*, the great maritime port of the Atlantic for the navy, and, in the S. W., *Lorient*. Proceeding further to the S., we find *Nantes*, with its two ports at the mouth of the Loire, *Paimbœuf* and *St. Nazaire*; *Les Sables d'Olonne*, now connected with Liverpool by a regular service of steamers; *Rochefort*, on the Charente, one of the great dockyards and naval stations; *La Rochelle*, a small but secure harbor; and *Bordeaux*, where the Gironde is nearly equal in width to the Thames at London. From this there is no seaport worthy of mention until we reach *Bayonne*, a place of difficult access. On the Mediterranean, *F* has the ports of *Cette*, *Marseilles* (the most spacious and secure on the coast), *Nice*, and the great maritime port, arsenal, and dockyard of *Toulon*. These ports are below separately given in their alphabetical order, and more or less briefly, according to their relative commercial importance.

Bayonne is a strongly fortified place in the department of Basses Pyrénées, at the confluence of the Neve with the Adour, 68 m. W. N. W. of Pau, in lon. 43° 29′ 29″ N., lon. 1° 28′ 33″ W. It is a fine and rich city, and a first-class fortress. The harbor is large and commodious; but there is a dangerous bar at its mouth. B. has extensive yards for the building of ships of war and merchant-vessels. Its commerce is chiefly with Spain; it has no direct trade with America. The hams of B. have long enjoyed a high celebrity. Pop. 22,307.

Bordeaux is one of the finest and wealthiest commercial cities of *F.*, formerly the capital of Guienne and Bordelais, and now the capital of the department of Gironde. It is situated 370 m. S. E. of Paris, in lat. 44° 50′ N., lon. 0° 25′ W., on the left bank of the Garonne, about 60 m. from its mouth, and in the middle of an extensive plain, which comprises the district of Médoc, well known for its red wines. Opposite the city the river makes a semicircular curve, and widens out into an extensive basin, which serves as a harbor, and is lined with quays on both sides for a distance of 3 m. This port is capable of accommodating upwards of 1,000 vessels, and such as do not exceed 800 tons can come up to the town. Ships of the greatest ordinary tonnage have depth enough as far as Pauillac, about 35 m. from the mouth of the river. The trade of B. is very extensive, particularly in wines, and has undergone a remarkable development since the introduction of railroads and steamships. For a long time B. was greatly indebted to the Languedoc canal, but this means of communication is now of minor importance. The total value of the export and import trade is annually about $75,000,000, about a third belonging to Great Britain. In 1878 the value of B. wines exported from *F* was upwards of $28,000,000, and the brandy and liqueurs from B. itself annually produce about $5,000,000. The other articles exported comprise corn, fruits, sugar, wool, resin, rags, madder, tartar, gums, indigo, and native manufactures. Ship-building is a leading industry, the number of firms in that department being about twenty in 1878. In the same year 230 vessels belonged to the port, with a total tonnage of upwards of 92,000 tons. Pop. [illegible].

Boulogne-sur-Mer, a fortified seaport, in the department of Pas-de-Calais, is situated on the shore of the English Channel, at the mouth of the river Liane, in lat. 50° 44′ N., lon. 1° 33′ E., 157 m. from Paris. The entrance to the harbor of B., which is tidal, is formed by two long piers running out from the mouth of the river and serving during fine weather as excellent promenades. On the western side is the basin excavated by Napoleon for his flotilla of flat-bottomed boats in 1804. A large wet dock, constructed at a cost of upwards of $1,250,000, was opened in 1872, and adds greatly to the facilities of the port, its area being 17 acres and the length of its quay-wall 1,150 yards. The depth of water in the harbor is 23 feet at spring-tide and nearly 20 at neap-tide; in the sluice of the floating basin the numbers are 29½ and 23½ respectively. The foreign commerce of B. consists chiefly in the importation of manufactured goods, jute, silk, Australian wool, coal, machinery, hardwares, paper hangings, malt, beer, and chemicals; and the exportation of wine, brandy, eggs, artificial flowers, haberdashery, and musical instruments. The total value of the exports in 1878 was $67,804,070, and of the imports, $61,058,000. In the value and extent of its fisheries B. is exceeded by no seaport in *F*. The most important branch is the herring-fishery, which is prosecuted northwards along the shores of Scotland; next in value is the mackerel-fishery, and next again the Iceland cod. B. has for a long time been one of the most Anglicized of French cities; and in the tourist season a continuous stream of English travellers reach the Continent at this point. There is regular steamboat service between the port and Folkestone, the average passage occupying 2¼ hours, or about three quarters of an hour longer than from Calais to Dover. Pop. 40,075.

Brest is a strongly fortified maritime town in the department of Finistère, on the N. side of a spacious and magnificent land-locked bay, near the extremity of the peninsula of Brittany, 310 m. W. S. W. of Paris, in lat. 48° 23′ 32″ N., lon. 4° 29′ 25″ W. It occupies the slopes of two hills, divided by the river Penfeld, the part of the town on the left bank being regarded as B. proper, while the part on the right is known as Recouvrance, from the chapel of the Virgin, to whom the shipwrecked sailors used to address their prayers for the recovery of their property. The harbor, situate between B. and Recouvrance, is in the form of a long canal, and is capable of containing 60 ships of the line. The great convict establishment, which formerly held some 3,000 convicts, was vacated in 1860, and is now used as a storehouse. The government naval arsenal and dockyard are very extensive, and the Hôpital de la Marine contains 26 wards, each with 53 beds. The manufactures are few, and the trade is of small extent considering the excellence of the ports, being principally limited to the supplying of provisions to the town and military post. Pop. 66,828.

Calais is a fortified seaport town in the department of Pas-de-Calais, 22½ m. E. S. E. of Dover, and 185 m. from Paris, in lat. 50° 57′ 45″ N., lon. 1° 51′ E. The harbor is shallow, admitting vessels of from 400 to 500 tons only at high water. There are two lighthouses at the entrance of the harbor, and a still larger one on the fortifications, with a revolving light visible 20 miles off. The imports are chiefly from Great Britain. The manufacture of *tulle*, or bobbinet, is one of the main sources of prosperity of the town and suburbs. Steamers carrying the mails cross twice a day to Dover and back. It is the principal landing-place for English travellers on the Continent. The terminus of the proposed tunnel beneath the Channel is near Sangatte, a village 6 m. W. of C. The project has received the sanction of the French and English governments. Pop. 13,843.

Cette, in lat. 43° 24′ N., lon. 3° 42′ E., is situated in the department of Hérault, on the narrow strip of land which separates the étang or lagoon of Thau from the sea, 15 m. S. W. of Montpellier. It forms one embouchure of the Great Canal of Languedoc, a circumstance to which its rise and prosperity is alone attributable, as the port is not very good, nor has it the natural facilities for becoming so. It has also a canal communication with the Rhone. The harbor, which has from 16 to 19 feet water, and can accommodate about 400 vessels, is formed by two lateral moles, with a breakwater across the entrance. The moles are fortified, and on the principal one is a lighthouse, elevated 84 feet above the level of the sea. A considerable trade is carried on in the wines and brandies of Languedoc, of which C. is the depot. The salt-works on the adjoining lagoon are pretty extensive; as are also the fisheries, particularly that of sardines. C. has regular steam-communication with Algiers, and the chief ports on the E. coast of Spain. About 150,000 tons of shipping (including coasters) enter annually. Pop. 28,152.

Cherbourg is a strongly fortified seaport town, and one of the principal naval depots of *F.*, in the department of the Manche, in lat. 49° 43′ 9″ N., lon. 1° 35′ W., at the bottom of a bay formed by Cape Levi on the E. and Cape La Hogue on the W., at the mouth of the Divette, 185 m. W. N. W. of Paris. Its principal interest is derived from its arsenal and fortifications. From its advanced position in the English Channel, it has long been a favorite object with the French government to render C. a great naval stronghold, and a secure asylum for ships of war; and, to accomplish this, vast sums have been expended upon it. The harbors for merchantmen and vessels of war are quite distinct from each other. The latter, which was constructed by Napoleon I., is a magnificent work, excavated out of the solid rock; is 328 yards long by 250 wide, and capable of accommodating 50 sail of the line, which may enter at will, there being 25 feet of water at low ebb. There are, besides, 4 superb graving-docks, and a basin. Near the naval port is the great and extensive dockyard, etc. The roadstead of C. is one of the best in the channel, and capable of contain-

ing 400 sail. It is defended on all sides by batteries, and further protected from N. winds and heavy seas by a massive breakwater, commenced in 1784, and finally completed by Napoleon III., in 1864. Its length is 4,120 yards; breadth at base, 262 feet, and at its summit 101 feet. On its central part a battery is erected As a commercial port, C. is of comparatively small importance. Pop. 36,338.

Dieppe is a seaport town of the department of Seine-Inférieure, at the mouth of the Arques, on the English Channel, 38 m N of Rouen and 92 m. N. W. of Paris. The port, enclosed by two jetties and bordered by quays, can accommodate from 60 to 80 vessels under 600 tons; but it dries at low water, and it is otherwise inconvenient. D. has an active general trade, ship building docks, manufactories of ivory-wares, watches, lace, etc., and it is a packet station, communicating daily by steamboats with Newhaven, England. D. is also largely concerned in the herring, mackerel, and oyster fisheries. It is a favorite seaside resort. Pop. 19,946.

Dunkirk [Fr *Dunkerque*], a strongly fortified seaport in the department of Nord, is on the Straits of Dover, 194 m. N. from Paris, in lat. 51° 2′ N., lon. 2° 22′ 32″ E It is divided into three parts: the town proper, which is the centre of trade; the low town, containing the principal industries; and the citadel, including docks and granaries, and containing the houses of laborers and sailors. D. is both a naval port and one of the merchant ports of Paris, and has two harbors, its maritime trade employing about 5,000 vessels, with a tonnage of 270,000. The docks occupy about 100 acres. It possesses sugar-refineries, starch-manufactories, distilleries, foundries, and large ship-building yards. The fisheries of the coast are valuable and extensive. Pop. 35,012.

Fécamp, a seaport town in the department of Seine-Inférieure, is situated on the English Channel, at the mouth of a small cognominal river 23 m. N. N. E. of Hâvre. It occupies the bottom and sides of a narrow valley opening out towards the sea, between two cliffs, on one of which stands a lighthouse. Its port, though small, is one of the best on the Channel, and has been greatly improved by the construction of an inner port with a fine quay, etc. It carries on a considerable trade in Baltic and colonial produce, brandy, salt, etc.; and sends out vessels to the whale, cod, mackerel, and herring fisheries. In 1878 there entered 178 vessels, with a total tonnage of 27,167. The river affords abundant water-power for numerous cotton, oil, and other mills. Fécamp has also sugar refineries, tanneries, building-docks, and manufactures of hardware, candles, soda, etc. Pop. 12,651.

Hâvre, or ***Le Hâvre***, is the principal commercial seaport on the W. coast of *F*, in the department of Seine-Inférieure, on the English Channel, near the mouth of the Seine, on its northern bank, 109 m. W. N. W. of Paris, in lat. 49° 29′ 14″ N., lon. 0° 6′ 38″ E. It was a saying of Napoleon I. that "Paris, Rouen, Le Hâvre, ne forment qu'une seule ville, dont la Seine est la grande rue." H. being, in fact, the seaport of Paris, most of the colonial and foreign products destined for its consumption are imported thither. Nearly double the quantity of goods, estimated by weight, is annually imported at Marseilles; but the total value of the imports at Hâvre amounts very nearly to that of those at the former port. The principal imports are cotton, sugar, coffee, linen thread and linen goods, rice, indigo, tobacco, hides, dyewoods, spices, drugs, timber, iron, tin, dried fish, grain and flour from the U. States, etc. H. receives the $\frac{7}{10}$ of the cotton imported into *F*., and is in this respect to *F*. what Liverpool is to England. The principal exports are silks, woollen and cotton stuffs, lace, gloves, and shoes, trinkets, perfumery, champagne and other wines, brandy, glass, furniture, books, etc. H. is to the N. of *F*. what Marseilles is to the S., to which it is second in the number of its mercantile marine. Besides the navigation of the Seine, H. is connected with Paris by lines of railroad, and is visited annually by about 3,000 vessels engaged in the foreign trade, and about 3,500 coasting vessels. Lines of sailing ships are established between H. and New York, New Orleans, etc. A regular intercourse is kept up with New York by means of steamers of the *Compagnie Transatlantique*, which is here located, and of the German line of Hamburg, which has a station at H. Most of the goods imported into H. are destined for the internal consumption of *F*. The coasting and the foreign trades are of considerable importance, and are steadily increasing. The harbor, which takes in ships drawing 24 feet at all tides, consists of 3 basins separated from each other and from the outer port by 4 locks. A large body of water being retained by a sluice and discharged at ebb-tide, clears the entrance to the harbor, and prevents the accumulation of filth, sand, etc. Cape de la Heve, forming the northern extremity of the Seine, lies N. N. W. from Hâvre, distant about 2½ m. It is elevated 390 feet above the level of the sea, and is surmounted by 2 lighthouses 50 feet high. These, which are 325 feet apart, exhibit powerful fixed lights. There is also a brilliant harbor light at the entrance to the port, on the extremity of the western jetty. H. has 2 roadsteads. The greater or out road is about a league from the port, and rather more than ½ league W. S. W. from Cape de la Heve; the little or inner road is about ½ league from the port, and about ¾ of a mile S S.E. from Cape de la Heve. They are separated by the sandbank called *Leclat*, between which and the bank called *Les Hautes de la Rade* is the N. W. passage to the port. The Hoc, or S. passage, lies between the last-mentioned bank and that of Amfar. In the great road there is from 6 to 7½ fathoms water at ebb; and in the little, from 3 to 3½. Large ships always lie in the former. The rise of the tide is from 22 to 27 feet; and by taking advantage of it the largest class of merchantmen enter the port. The water in the harbor does not begin perceptibly to subside till about 3 hours after high water, — a peculiarity ascribed to the current down the Seine across the entrance to the harbor being sufficiently powerful to dam up for a while the water in the latter. Large fleets, taking advantage of this circumstance, are able to leave the port in a single tide, and get to sea, even though the wind should be unfavor-

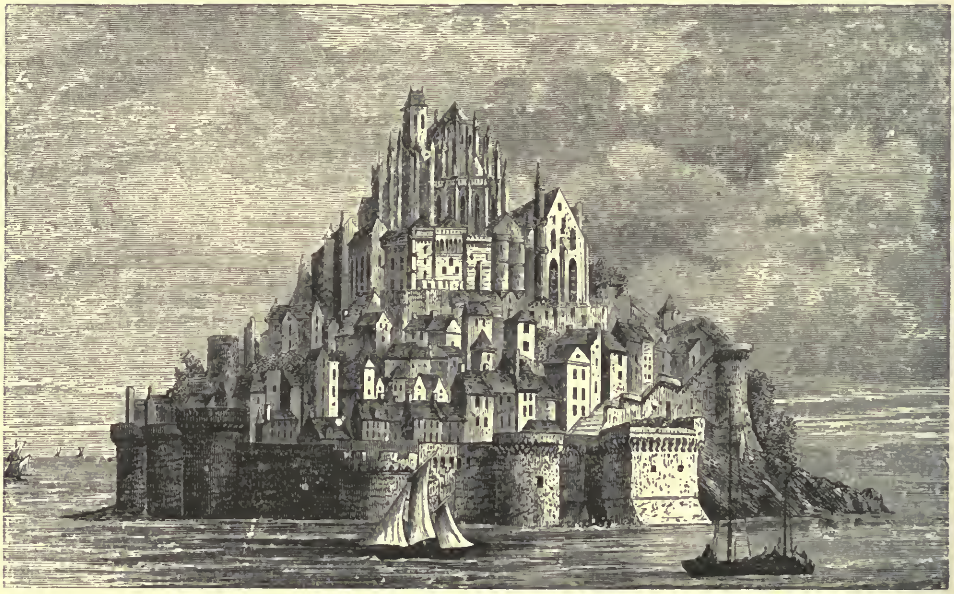


Fig 208. — Mont St. Michel.

able. — There belonged to the port, in 1876, 422 merchant-vessels, of the aggregate burden of 149,211 tons. Pop. 85,417.

Pilotage. From the outer roadstead 28 francs per 1st 100 tons; 25 francs 2d do.; 21 francs 3d do.; and the pilot to be fed. If the vessel be boarded nearer the port, the charge is lessened accordingly. Boats, from 9 to 30 francs, according to the distance.

Harbor Rules. 1. It is forbidden to have fire, or lighted candle, or to smoke on board ships in the harbor. 2. Vessels coming into and lying in the docks must have the lower and topyards topped up, jib-booms and martingales rigged in, and anchors taken in. The wharf alongside the vessel must be swept every evening. 3. No gunpowder (whatever may be the quantity), is allowed to remain on board, and must be deposited in the gunpowder warehouse. 4. All foreign sailors found away from their ships after 10 o'clock at night, from the 1st of April to the 1st of October, and after 9 o'clock from the 1st of October to the 1st of April, shall be conveyed to prison and fined. Sailors are forbidden to wear sheathing-knives ashore. 5. The manifest of the cargo, signed by the captain, must be exhibited to and signed by the custom-house officers before being taken ashore. The vessel must be reported at the custom-house within 24 hours after arrival. 6. Tobacco, snuff, segars, loose or in boxes, belonging to the captain, officers, and mariners to be declared as exactly as possible. All the tobacco, snuff, and segars declared or not declared, to be exhibited to the custom-house officers when they come and make the visit on board. After such exhibition, if any quantity of tobacco and segars be found on board, it shall be seized, the captain shall be condemned to pay a fine which may be as high as 500 francs, and the ship shall be confiscated.

La Rochelle is a fortified seaport of the department of Charente-Inferieure, on an islet of the Bay of Biscay, formed by the islands Ré and Oleron, 300 m. N. W. of Paris. The inner harbor, which has two basins, in which ships of any size may remain afloat, is surrounded by fine quays and commodious docks, close to which lie the principal streets and squares. The principal exports are wine and brandy. Pop. 15,647.

Lorient is a seaport of the department of Morbihan, at the confluence of the Scorff with the Blavet, at the head of the Bay of Port Louis, about 3 m. from the Atlantic, and 29 N. W. of Vannes. The harbor is ample, secure, and of easy access, and bordered by fine quays, on which are large and commodious buildings. Like Brest, it is a natural dockyard; as a port of war it ranks third, and as a port of construction it ranks first. More ships of war are now built at Lorient than at any other port in *F.* Its trade is chiefly coastwise. Pop. 37,655.

Marseilles [Fr. *Marseille*] is a large commercial city and the chief seaport of *F.*, capital of the department of Bouches-du-Rhône, on the E. side of a bay of the Gulf of Lyons, 420 m. S.E. of Paris, in lat. 43° 17′ 49″ N., lon. 5° 22½′ E. It is situated in the centre of a plain about 7 m. broad, bounded by lofty hills extending in the form of a crescent until each extremity reaches the sea. The port consists of the natural harbor, called *Vieux Port*, and the two basins formed within the Breakwater, called respectively *Port de la Joliette* and *Port Napoleon*. The Vieux Port, about 1,000 yards long and 300 wide, has a very narrow entrance between two old forts, but is one of the safest ports in the world. Dredging-machines are constantly at work to maintain a uniform depth of about 18 feet throughout the Old Port, which is exclusively reserved for sailing ships, which usually lie in tiers on the N. and S. sides, and mostly discharge their cargoes over their bows on to the quays. A breakwater, 2,400 metres long, lies off the land on the N. side of the Old Port, and has a lighthouse on each end. A vessel on rounding the S. entrance of this breakwater enters the port of La Joliette to the left, a basin about 600 yards long by about 400 wide. It is surrounded on all sides by spacious quays, and furnished with iron tramways for the conveyance of merchandise in railway trucks to the dock buildings and railway station. La Joliette is used for steam as well as for sailing vessels of considerable draught of water; the whole N. and about half the W. sides being reserved for the fleet of steamships belonging to the *Messageries Nationales*. An opening with a turning bridge leads from La Joliette to the Port Napoléon, which is considerably more spacious than the former. On its E. side there are two basins, *du Lazaret* and *d'Arenc*, with spacious quays for the whole. In this harbor the ships lie broadside on to the wharves, and discharge their cargoes. The great dock warehouses form a range of buildings of stone and iron, six stories high, and capable of containing 40,000 tons of general merchandise. In both of these artificial ports there is ample depth of water for the largest ships, but unfortunately neither of them is very safe when the wind blows violently from the N. W. or N. E. The whole, including the old harbor, would contain at one time as many as 2,000 vessels. The isles of Rattoneau and Pomegues, and that named after the celebrated Château d'If, all fortified, lie in a cluster off the port, the latter distant about 1½ m. in a W. S. W. direction. Rattoneau and Pomegues are connected by a breakwater, and thus form a very convenient port, almost exclusively used for the quarantine service. Outside of these islands lies a reef with a lighthouse called *La Planier* in lat. 43° 11′ 54″ N., lon. 5° 13′ 59″ E. It is distant about 4½ m. from the island Le Maire, lying to the E. of it, both of them being about 7 m. from the Château d'If. The custom-house is on the quay of the Old Port, and there is a branch at Port de la Joliette, principally for the examination of passengers' luggage. The Tribunal of Commerce sits in the Exchange, and the judges are periodically elected from amongst the leading merchants. All the principal mercantile offices are near the head of the Old Port. Vessels approaching the harbor of M. generally heave to for a pilot on approaching the islands, and they are charged pilotage whether they take one or not. French ships and foreign vessels having reciprocity treaties, upwards of 80 tons burden, pay for pilotage 22 centimes per ton inwards, and 15 outwards. If the pilot is taken on board 6 or 7 m. off the port, the full charge is paid; it is reduced ⅓ if he comes on board 2 or 3 m. off, and ½ if he comes on board at the entrance of the port. Immediately on receiving pratique, the ship is taken to the old or new harbor, according to the nature of the cargo she has on board, or the goods she may have to take in. The only charge leviable on ships visiting M. consists of a small payment at the health office for the bill of health. It amounts to from 5 to 15 centimes per ton. There are no tonnage, anchorage, or light dues of any sort. Ballast is of course paid for. Vessels can be well repaired at M., but the charges are high. The charges for docking are as follows: —

Sailing Ships.

	Francs.	Centimes.
Entering into and leaving the dry dock on the same day, per ton.	0	80
For every day beyond the first day and per ton	0	40

Steamships.

	Francs.	Centimes.
Entering into and leaving the dry dock on the same day, per horse-power...............	4	0
For every day beyond the first day and per horse-power	2	0

No payment will be received on any sailing vessel for less than 250 tons. No payment will be received on any steam-vessel for less than 60 horse-power. Upon steam-vessels whose horse-power exceeds that of 250 horses, the prices above mentioned will be reduced ⅓ for every horse-power above the 250 first and up to 400, and ½ for all beyond the first 400. For sailing ships upwards of 1,000 tons, the foregoing prices will be reduced ⅓ for every ton above the first 1,000 and up to 1,500, and ½ for every ton above 1,500. — The *Rules of the harbor* are the same as those enforced in the port of Havre, and given above. — The approaches to the port are admirably lighted, and the service is kept up without any charge to the shipping. The different lights in the bay or at the entrance of the port are described at the end of this article. The mistral, or N. W. wind, is the prevailing one; it blows in very heavy gusts, which render the approach to the port of M. exceedingly difficult at times, and vessels rarely leave the port until it subsides.

M. is a city of great antiquity, and has long enjoyed a very extensive commerce. It is the grand emporium of the S. of France, and the centre of $\frac{8}{15}$ of its commerce with the countries on the Mediterranean and Black Seas. The exports consist principally of silk stuffs, wines, brandies, and liquors; woollens and linens; madder, oil, soap, refined sugar, perfumery, stationery, verdigris, and all sorts of colonial products. Among the principal imports are sugar, coffee, and other colonial products; dyestuffs; corn from the Black Sea and the N. coast of Africa, cotton from Egypt and America; coal, linen, thread, and various descriptions of manufactured goods from England; with hides, wool, tallow, timber, etc. M. engrosses almost the whole trade between France and Algiers. It is now also the principal seat of the intercourse carried on by steamers with Malta, Alexandria, and Constantinople; and besides the steamers employed by the government as packets, it ran upward of 40 steamers belonging to private companies. In 1877 there belonged to the port 865 sailing and steam vessels of the burden of 153,714 tons. In 1878, 42 American vessels (tonnage 20,737) entered, and 24 (tonnage 16,494) cleared the port. The manufactures of M. are very important and various. The most important are soap, coral articles, silk stuffs, woollens, cottons, linens, hats, leather, sail cloth, china, alum, sulphur, vitriol, salt, etc. There are, besides, refineries for sugar, and manufactures of vinegar and liquors. Another branch of industry is the pickling and preparing for exportation of capers, olives, and other fruits, as well as large quantities of fish. It has also a great variety of trades connected with the building and fitting out of ships and steamers. Pop. 231,880.

Nantes, an important city and seaport, capital of the department of Loire-Inférieure, is situated on the Loire, about 34 m. from its mouth, 210 m. S. W. of Paris, in lat. 47° 13′ 6″ N., lon. 1° 32′ 41″ W. Its situation renders N. the emporium of all the rich and extensive country traversed by the Loire, so that it has a pretty considerable import and export trade, particularly with the West Indies. The exports consist of all sorts of French produce, but principally of brandy, wine, and vinegar, silk, woollen, and linen goods, refined sugar, wheat, rye, and other kinds of grain, biscuits, sardines, preserves, etc. The principal imports are sugar, coffee, and other

colonial products, cotton, indigo, timber, hemp, etc N is a considerable entrepôt for the commerce of salt, large quantities being made in the department, principally at Noirmoutier and Croisic. No vessel drawing more than 11 or 12 feet can come up to the city, unless at high water a day or two before *full* and *change*. Vessels drawing 18 or 19 feet water come up to Paimbœuf, about 24 m. lower down the river. Larger ships either remain at St. Mazaire, at the mouth of the river, or at least discharge part of their cargo there. There are three entrances to the Loire. The first and most generally frequented is between the bank called *Le Four* and *Point Croisic;* there is a second between Le Four and the bank called *La Banche;* and a third, which in southerly winds is much resorted to, between the latter and the rocks, called *La Couronne*. The navigation, which is naturally rather difficult, has been much facilitated by the erection of lighthouses and beacons The depth of water on the bar at the mouth of the river varies from 2 to 2¾ fathoms. At springs the rise is 14, and at neaps, 7 or 8 feet. High water at full and change 3¼ hours. In 1877 there belonged to the port of N, ex-river craft, coasters, and steamers, 768 ships, of an aggregate burden of 147,851 tons. N. is the second port in *F.* for commercial shipping. The city, with its magnificent quays, its splendid river dotted with islands, its handsome bridges spanning its surface and uniting its different parts, the harbor of Lafosse, its lofty edifices, its crowd of shipping of all rig and nations, and its miles of lawn-like meadows stretching far away on either bank of the Loire and Erdre, produces a *coup d'œil* of beauty, magnificence, and prosperity, not to be surpassed by any other city in France. Pop. 116,093.

Nice is a city and seaport in the department of Alpes Maritimes, on the Mediterranean, 95 m. S W. of Genoa. It is beautifully situated at the foot of the Alps, which protect it from the N. and E. winds. Owing to its genial climate, it is a resort for invalids from all parts of Europe during the winter months. The port is small, but is convenient for vessels of 300 tons burden. The principal exports are oil, wine, oranges, and hemp. Pop. 46,683.

Rochefort is a seaport and naval arsenal in the department of Charente-Inférieure, on the Charente, 5 m. from its mouth, and 18 m. S. E. of La Rochelle, in lat. 45° 56′ 6″ N., lon 1° 57′ 7″ W. It is the third military port of *F.* in importance, and contains numerous public works, but its foreign trade is little. Pop 25,454

St. Malo is a seaport town of the department of Ille-et-Vilaine, on the British Channel, 200 m S W. of Paris. It is built on the peninsula of Aron, connected by a causeway with the mainland, and strongly fortified. The port on the S. side is commodious and secure, but rather difficult of entrance *Manuf.*, rope, fishing-nets, blocks, and other marine fittings. It has a considerable trade in provisions with the French colonies, a brisk coasting-trade and numerous vessels engaged in the mackerel, cod, and whale fisheries. Pop 12,000

Toulon is the second naval port of *F.* in importance, in the department of Var, at the bottom of one of the finest harbors of the Mediterranean, 32 miles E S E of Marseilles, and 190 m S. S E of Lyons, in lat. 43° 7′ 5″ N., lon. 5° 56′ E The town is strongly fortified, being surrounded by a double rampart, and a large and deep ditch, defended to the E., W., and N by hills covered with redoubts. Both the old and new harbors are artificial. The latter, formed by hollow and bomb-proof jetties running off from the E. and W. sides of the town, is sufficiently extensive to accommodate 30 sail of the line, as many frigates, and an equal proportion of small craft. The entrance is shut by a boom, and it is never ruffled by any wind to occasion damage. The arsenal of *T.* is one of the finest in Europe. The *Bagne*, instituted in 1682, is, from want of room on shore, established on board some hulks; it is occupied by criminals condemned to hard labor for ten years and under The foreign trade of the port is inconsiderable. Pop 61,382

Frangipane, a perfume of jasmine.

Frangote, a bale of goods in Spain.

Frankfort-Black, a pigment said to be prepared by burning vine-branches, grape-stones, and the refuse lees of the wine manufacture, etc., used for copperplate printing.

Frankincense, a name for the gum olibanum of commerce, an odoriferous resin obtained from several species of *Boswellia*. The European frankincense is a resinous exudation from the spruce fir, and is used in the composition of plasters.

Franking, a carpenter's term for window-sashes in which the cross-pieces of the frame intersect each other.

Franklin, a fire-insurance Co., located in Boston, Mass., organized in 1873. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $7,980.31; total cap. and surplus, $207,980.31; risks in force, $7,346,961; premiums, $87,715.11; premiums received since the organization of the Co., $604,559.85; losses paid, $291,461.95; cash dividends paid to stockholders, $66,000.

Franklin, a fire-insurance Co. located in New York City, organized in 1876. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; risks in force, $4,512,819; premiums, $30,741.83; premiums received since the organization of the Co., $268,067.78; losses paid, $159,528.21.

Franklin, a fire-insurance Co., located in Philadelphia, Pa., organized in 1829. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $400,000; net surplus, $960,476.32; total cap. and surplus, $1,360,476.32; risks in force, $142,867,352; premiums, $2,561,774.19; premiums received since the organization of the Co., $19,866,252.51; losses paid, $11,088,837.23; cash dividends paid to stockholders, $3,708,000.

Franklinite, an ore of iron, zinc, and manganese.

Frasco, the name of a flask or case bottle in Brazil, containing about 3¾ pints.

Fraud, a dishonorable transaction; adulteration, deception; a cheat, etc.

Fray, to fret or rub; to unweave.

Frazil, Frazli, the Arabian name for a bale of variable weight, ranging from 18½ lbs. to 30 lbs.

Frederick d'or, an old gold coin of Prussia, worth about $4.

Freeboard, that part of a vessel's side which is included between the plank-sheer and the water-line.

Freebord, ground outside a fence.

Free Goods, goods which are admitted into a country free of duty.

Free-Martin, a heifer incapable of breeding; the barren twin calf whose mate is a bull calf.

Free on Board. See F. O. B.

Free Port, a port or harbor where goods may be landed, warehoused, and exported free of custom-duty.

Freestone, is not in itself a particular kind of stone, but is the name given by the quarryman and the mason to any stone which, having no grain, works freely under the tools. The name applies to some kinds of limestone as well as to some of sandstone.

Free-Trade. See PROTECTION AND FREE TRADE.

Free Vintner, in England, a member of the vintners' company; one who can sell wine without a license.

Freezer, an apparatus for freezing cream, fruits, or water ices, of which there are many kinds. They substantially consist of a metallic cylinder containing the liquid to be cooled or congealed, enclosed by another cylinder, and surrounded by the freezing mixtures. The machine is rotated (Fig. 209) or oscillated to thoroughly agitate the liquids, and bring new particles to the cold surface. The *freezing mixture* commonly used consists of ice broken small, and mixed with about half its weight of common salt.

Freight is the sum paid by the merchant or other person hiring a ship, or part of a ship, for the use of such ship or part during a specified voyage or for a specified time. The *F.* is most commonly fixed by the charter-party or bill of lading, but in the absence of any formal stipulations on the subject, it would be due according to the custom or usage of trade. In the case of a charter-party, if the stipulated payment be a gross sum for an entire ship, or an entire part of a ship, for the whole voyage, the gross sum will be payable, although the merchant has not fully laden

the ship; and if a certain sum be stipulated for every ton, or other portion of the ship's capacity, for the whole voyage, the payment must be ac-

Fig. 209. — Packer's Double-Action Freezer.

cording to the number of tons, etc., which the ship is proved capable of containing, without regard to the quantity actually put on board by the merchant. On the other hand, if the merchant have stipulated to pay a certain sum per cask or bale of goods, the payment must be, in the first place, according to the number of casks and bales shipped and delivered; and if he have further covenanted to furnish a complete lading, or a specific number of casks or bales, and failed to do so, he must make good the loss which the owners have sustained by his failure. If an entire ship be hired, and the burden thereof be expressed in the charter-party, and the merchant bind himself to pay a certain sum for every ton, etc., of goods which he shall lade on board, but does not bind himself to furnish a complete lading, the owners can only demand payment for the quantity of goods actually shipped. But if the merchant agree to load a full and complete cargo, though the ship be described as of less burden than she really is, the merchant must load a full cargo, according to the *real burden* of the ship, and he will be liable for *F.* according to what ought to be loaded. — The delivery of goods at the place of destination is in general necessary to entitle the owner to *F.*; but with respect to living animals, which may frequently die during the voyage without any fault or neglect of the persons belonging to the ship, it is ruled that if there be no express agreement whether the *F.* is to be paid for the lading or for the transporting them, *F.* shall be paid as well for the dead as for the living; if the agreement be to pay *F.* for the *lading*, then death certainly cannot deprive the owners of the *F.*; but if the agreement be to pay *F.* for *transporting* them, then no *F.* is due for those that die on the voyage, because as to them the contract is not performed. These distinctions have been made in the civil law, and have been adopted into the modern systems of maritime law. — *F.* is most frequently contracted to be paid either by the whole voyage, or by the month, or other time. In the former case the owners take upon themselves the chance of the voyage being long or short; but in the latter the risk of the duration falls upon the merchant; and if no time be fixed for the commencement of the computation, it will begin from the day on which the ship breaks ground and commences her voyage, and will continue during the whole course of the voyage, and during all unavoidable delays *not occasioned by the act or neglect of the owners or master*, or by such circumstances as occasion a suspension of the contract for a particular period. Thus, the *F.* will be payable for the time consumed in necessary repairs during a voyage, provided it do not appear that the ship was insufficient at the outset, or that there was any improper delay in repairing her. In the absence of an express contract to the contrary, the entire *F.* is not earned until the whole cargo be ready for delivery, or has been delivered to the consignee according to the contract for its conveyance. — If a consignee receive goods in pursuance of the usual bill of lading, by which it is expressed that he is to pay the *F.*, he, by such receipt, makes himself debtor for the *F.*, and may be sued for it; but a person who is only an agent for the consignor, and who is known to the master to be acting in that character, does not make himself personally answerable for the *F.* by receiving the goods, although he also enters them in his own name at the custom house. — In some cases *F.* is to be paid, or rather an equivalent recompense made to the owners, although the goods have not been delivered at the place of destination, and though the contract for conveyance be not strictly performed. Thus, if part of the cargo be thrown overboard for the necessary preservation of the ship and the remainder of the goods, and the ship afterwards reach the place of destination, the value of this part is to be answered to the merchant by way of general average, and the value of the *F.* thereof allowed to the owner. So, if the master be compelled by necessity to sell a part of the cargo for victuals or repairs, the owners must pay to the merchant the price which the goods would have fetched *at the place of destination*, and therefore are allowed to charge the merchant with the money that would have been due if they had been conveyed thither. — When goods are deteriorated during a voyage, the merchant is entitled to a compensation, provided the deterioration has proceeded from the fault or neglect of the master or mariners; and of course he is not answerable for the *F.*, unless he accept the goods, except by way of deduction from the amount of the compensation. On the other hand, if the deterioration has proceeded from a principle of decay naturally inherent in the commodity itself, whether active in every situation, or in the confinement and closeness of a ship, or from the perils of the sea, or the act of God, the merchant must bear the loss and pay the *F.*; for the master and owners are in no fault, nor does their contract contain any insurance or warranty against such an event. *F.* being the return made for the conveyance of goods or passengers to a particular destination, no claim arises for its payment in the event of a total loss. In case of a total loss with salvage, the merchant may either take or abandon the part saved, but after the merchant has made his election he must abide by it. — It frequently happens that the master or owner fails to complete his contract, either by not delivering the whole goods to the consignee or owner, or by delivering them at a place short of their original destination; in these cases, if the owner or consignee of the goods *derive any benefit from their conveyance*, he is liable to the payment of *F.* according to the proportion of the voyage performed; and though contracts of this nature be frequently entire and indivisible, and the mas-

ter or owner of the ship cannot, from their nature, sue thereon, and recover a ratable freight, yet he may do so upon a fresh *implied* contract, for as much as he deserves to have, unless there be an express clause in the original charter-party or contract to the contrary. A fresh implied contract is inferred from the owner's or consignee's acceptance of the goods. Many difficulties have, indeed, arisen in deciding as to what shall amount to an acceptance: it is not, however, necessary actually to receive the goods; acceptance may be made by the express or implied directions, and with the consent of the owner or consignee of the goods, but not otherwise. — The time and manner of paying *F.* are frequently regulated by express stipulations in a charter-party, or other written contract; and when that is the case they must be respected; but if there be no express stipulation contrary to or inconsistent with the right of *lien*, the goods remain as a security till the *F.* is paid; for the master is not bound to deliver them, or any part of them, without payment of the *F.* and other charges in respect thereof. But the master cannot detain the cargo on board the vessel till these payments be made, as the merchant would, in that case, have no opportunity of examining the condition of the goods. In this country, the practice is, when the master is doubtful of payment, and that *F.* is not paid in the 24 hours of the landing, to send such goods to a public warehouse, ordering the warehouseman not to part with them till the *F.* and other charges are paid. No right of lien for *F.* can exist unless the *F.* be earned; if the freighter or a stranger prevent the *F.* from becoming due, the ship owner or master's remedy is by action of damages.

Freighter, he to whom a ship or vessel has been hired.

Fremont, Elkhorn, and Missouri Valley R.R. runs from Fremont to mouth of Niobrara River, Neb., 150 m., of which only 51.13 m., from Fremont to Wisner, Neb., are at present in operation, and leased under temporary contract to the Sioux City and Pacific R R. Co. for 33⅓% of gross earnings. The Co.'s offices are in Cedar Rapids, Ia. *Financial statement:* Cap. stock paid in, $690,000; funded debt, 1st mortgage 7% bonds, issued 1871, $690,000, payable 1901, interest April and October.

French-Bean, a dwarf variety of the *Phaseolus vulgaris*, or common bean.

French-Berries, berries used in dyeing. See AVIGNON-BERRIES.

French-Chalk, indurated talc; a magnesian mineral used to remove grease, stains, etc.

French-Horn, a musical wind-instrument of copper, having several curves. See HORN.

French Leaf, a kind of bronze leaf composed of copper and zinc, the proportion of zinc being larger than in the common Dutch leaf, and less than in the Florence leaf, and of a yellow color.

French Polish. Several varnishes for furniture are used under this name. That most generally employed is a simple solution of 5½ oz. pale shell-lac in one pint of the finest wood naphtha. Sometimes a little mastic, sandarac, or elemi, or copal varnish is added to render the polish tougher. Sometimes, also, it is colored, in order to modify the character of the wood. A *reddish* tinge is given with dragon's blood, alkanet root, or red sanders wood; and a *yellowish* tinge, by turmeric root or gamboge. When it is simply desired to *darken* the wood, brown shell-lac is employed to make the polish; and when the object is to keep the wood *light colored*, a little oxalic acid (2 to 4 dr. to the pint) is commonly added. These substances are either steeped in or agitated with the polish, or with the solvent, before pouring it on the "gums," until they dissolve, or a sufficient effect is produced. French polish is not required to be so clear and limpid as other varnishes, and is, therefore, never artificially clarified.

French Polishing. This process, now so generally employed for furniture and cabinet work, is performed as follows: The surface to be operated on being finished off as smoothly as possible with glass paper, and placed opposite the light, the "rubber" being made as directed below, and the polish (see above) being at hand, and preferably contained in a narrow-necked bottle, the workman moistens the middle or flat face of the rubber with the polish, by laying the rubber on the mouth of the bottle and shaking up the varnish against it, once, by which means the rubber imbibes the proper quantity to cover a considerable extent of surface He next encloses the rubber in a soft linen cloth, doubled, the rest of the cloth being gathered up at the back of the rubber to form a handle The face of the linen is now moistened with a little raw linseed-oil, applied with the finger to the middle of it, and the operation of polishing immediately commenced. For this purpose the workman passes his rubber quickly and lightly over the surface, uniformly in one direction, until the varnish becomes dry, or nearly so, when he again charges his rubber as before, omitting the oil, and repeats the rubbing until three coats are laid on. He now applies a little oil to the rubber, and two coats more are commonly given. As soon as the coating of varnish has acquired some thickness, he wets the inside of the linen cloth, before applying the varnish, with alcohol, or wood naphtha, and gives a quick, light, and uniform touch over the whole surface The work is, lastly, carefully gone over with the linen cloth, moistened with a little oil and rectified spirit or naphtha, without varnish, and rubbed, as before, until dry. — The *rubber* is made by rolling up a strip of thick woollen cloth (list) which has been torn off, so as to form a soft elastic edge. It should form a coil, from 1 to 3 inches in diameter, according to the size of the work

French Sand, a silicious mineral imported from France, and used in the manuf. of glass.

French White, pulverized talc; carbonate of lead.

French Wine. See BURGUNDY, CHAMPAGNE, CLARET, etc.

Frequin, a cask used in France for holding sugar or treacle.

Fresco. This Italian word means *fresh;* and *fresco-painting* consists in painting upon fresh or wet plaster. When the rough plaster-work of a wall is finished, a surface of fine, smooth plaster is given to it. While this surface plaster is still wet, the artist paints upon it with mineral colors mixed with water. Only as much of the surface is plastered as can be painted the same day, while the surface remains sufficiently damp. There are many difficulties connected with the art, — to make the joinings in successive days' work invisible; to insure that the color on the wet plaster shall present the proper tints when the plaster is dry; and to produce a peculiarity of surface due to the line when the plaster dries properly.

Fret, to fray; to unweave. — In French, the hire of a ship; the cargo; the sum paid for the transport of goods; the freight.

Frett, a glass composition, composed of silica, lime, soda, borax, and lead, used as a glaze by potters.

Fretwork, carved or open wood-work, in ornamental devices and patterns.

Friar, in printing, a pale patch in a printed sheet.

Friar's-Balsam, a specific for wounds, popular in England. It is an alcoholic solution of benzoin, styrax, tolu balsam, and aloes.

Frickle, a bushel-basket.

Friction, in a general sense, the act of rubbing one body against another; attrition. — In *mechanics*, the resistance which the surface of a moving body meets with from the surface of the body on which it moves. The *F.* between two surfaces

varies greatly according to the material, although the perfection of workmanship may be quite equal. In oak upon cast-iron, the *F.* is greater than for brass upon cast-iron; while wrought-iron on wrought-iron is the greatest of the three. Generally speaking, two similar substances have more *F.* than two that are dissimilar; soft substances more than hard; and tables have been prepared showing the relative tendency of various combinations. One mode of lessening *F.* is by the use of lubricants, such as oil, grease, lard, soap, tar, black-lead, etc. Another is by the use of *friction*, or rather *anti-friction wheels.* This is an arrangement by which the *F.* of an axle is spread over a larger surface, and rendered less intense at the actual point of working. *F.* is not always a defect in machinery; the working of belts, bands, knots, breaks, etc., very much depends on the utilization of *F.*

Frieze, the nap on woollen cloth. — A kind of coarse woollen cloth or stuff, with a nap on one side. — In architecture, that portion of the entablature which is between the architrave and the cornice.

Friezing, the forming of the nap of woollen cloth into a number of little hard burs or prominences.

Frigard [Fr.], a pickled herring.

Fig 210. — FRIGATE.

Frigate, a fast-sailing ship of war (Fig. 210), carrying from 30 to 60 guns.

Frigeratory, a chamber maintained at a low temperature for the preservation of meat or vegetables

Frill, a ruff or edging round the neck, sleeves, etc., of a lady's dress.

Fringe, an ornamental bordering or edging; trimming for articles of dress and drapery; as, to bed-furniture, window-curtains, table-covers; made of various material, silk, worsted, gold, etc.

Frippery [Fr. *friperie*], old garments or furniture; trade in old clothes.

Frisado [Sp.], silk plush or shag.

Frisket, the iron frame of a printing-press, which keeps the sheet on the tympan.

Frit, in glass-making, the calcined materials; an imperfectly fused mass of silica, etc., having to be re-melted.

Frizettes, curls of hair or silk.

Frizons, a name for silk-waste in France.

Frizzing, in leather-manufacture, a process which consists in rubbing *chamois* and *wash* leather with pumice-stone or a blunt knife, after the skins have been *fleshed* and *raised*, till an even thickness is obtained throughout. — Also a peculiar finish given to the nap of woollen cloth, by forming it into a number of little prominences or tufts.

Frizzle [Scotch], the hammer of a gun or pistol; the fire-steel for a tinder-box.

Frock, a child's gown; a monk's dress; a gentleman's surtout or square-tailed long walking-coat.

Frog, an oblong button for coats or overcoats, swelling in the middle and tapering on both ends, covered with netted thread, and fastening into a loop instead of a button-hole. — A grooved piece of iron placed at the junction of the rails of a railroad where one track crosses another. When placed at a regular intersection of tracks, it is called *cross-frog.* — A loop or other ornament for a sword-hilt.

Fromage, the French name for cheese.

Froment, the French name for wheat.

Front, a set of false hair or curls for a lady. — The dicky for a shirt.

Frontignan, a luscious, fine, spirituous, and sweet muscadine white wine, made in the French department of Hérault. The Frontignan vine was almost destroyed by the oidium, and the genuine wine is now very scarce.

Frontispiece, the illustration of a book which faces the title-page. — In architecture, the principal face of a building.

Frontlet, a bandage for the forehead.

Frosted, the dead or lustreless appearance of unpolished gold, silver, or glass.

Frow, Frower, a cleaving tool, used by coopers for riving staves, etc.

Frowy-Stuff, a builder's name for short, or brittle and soft, timber.

Fruit [Fr. *fruit*; Ger. *Obst*, *Früchte*; It. *frutta*; Sp. *fruta*]. In familiar language this term is applied to any product of a plant containing the seed, more especially those that are eatable. Among botanists, however, and also in commerce, a *F.* is the mature ovary or pistil containing the ripened ovules or seeds, that is to say, the seed or seeds with the pericarp, as in *i*, Fig. 211. When divested of the walls or pericarp, a *F.* becomes, commercially, either seed or nut. Currants, strawberries, cranberries, and other kinds of berries are called *small F.* The term *dried F.* applies in commerce to such *F.* as raisins, currants, and figs dried (in the air or in sunshine) in the country of their growth, and packed for exportation. Each fruit being given in this work under its specific name, *F.* is considered here only collectively, as an extensive article of diet and general commerce. — The acidulous and subacid *F.* are antiseptic, aperient, diuretic, and refrigerant. They afford little nourishment, and are apt to promote diarrhœa and flatulency. The saccharine *F.*, or those abounding in sugar, are nutritious and laxative, but are apt to ferment and disagree with delicate stomachs when eaten in excess. Stone-fruits are more difficult of digestion than the other varieties, and are very apt to disorder the stomach and bowels. As a rule, *F.* should never be eaten in large quantities at a time, and only when quite ripe. It then appears to be exceedingly wholesome, and to be a suitable corrective to the grossness of animal food. It also exercises a powerful action on the skin, and is a specific for scurvy in its early stages. Many cutaneous diseases may likewise be removed by the daily use of a moderate quantity of *F.* or other fresh vegetable food. Cases are not uncommon which, after resisting every variety of ordinary medical treatment, yield to a mixed *F.* or vegetable diet. *F.* should be gathered in dry weather, and preferably about noon, because the dew and moisture deposited on them during the night and

earlier part of the morning has then evaporated. They should be quite ripe when gathered, but the sooner they are removed from the tree after this point is arrived at, the better. Immature *F.* never keeps so well as that which has ripened on the tree; and over-ripe *F.* is liable to be bruised and to lose flavor. The less *F.* is handled in gathering the better. Some of them, as *peaches, nectarines, grapes, plums*, etc., require to be treated with great delicacy, to avoid bruising them or rubbing off

Fig. 211. — Peach Tree and Fruit.

the bloom. Some *F.*, as a few varieties of *apples, pears*, and *oranges*, etc., are gathered before they are fully ripe, in order that they may the better undergo the perils of transit and storage.

In the statement of the Chief of the Bureau of statistics on the commerce of the U. States for the year 1878, our imports of *F.* for that year are valued at $9,738,546; but it must be observed that in this large figure are included the nuts (almonds, walnuts, filberts, etc.) which certainly enter for a large part in the total. Our exports of *F.* during the same year were as follows: —

Apples (green or ripe)	$386,261
" (dried)	260,085
Other fruits (green, ripe, or dried)	296,310
Fruit preserved in cans or otherwise	435,450
Total	$1,378,106

Imp. duty: green, ripe, or dried fruit, 10 per cent. Preserved in their own juice, or put up with water only in hermetically sealed cans, jars, or bottles, 25 per cent. Preserved in sugar, 35 per cent.

Fruit-Essences are sweet flavoring substances obtained from various kinds of *F.*, but most generally prepared artificially from amylic, butyric, pelargonic, valerianic, and other ethers mixed in alcohol, and colored to represent the juice of the *F.* from which they are supposed to be derived. By judicious mixtures, the flavor of almost any fruit can be more or less perfectly imitated. They are used by confectioners, and largely manufactured at Wolverhampton, England, and at Philadelphia.

Fruit-Jar, a jar for preserving fruit, usually made of glass, and sometimes of earthenware.

Fruit-Knife, a dessert-knife for cutting fruit. The blade is usually made of silver (or plated), which is not perceptibly acted upon by the acids of the fruit.

Fruit-Picker, an implement for reaching up to and picking fruit from a tree.

Frumentaceous, pertaining to wheat or other grain.

Frumentazzo, a name in the Mediterranean ports for damaged grain unfit for human food.

Frundele, a dry measure of two pecks.

Frying-Pan, a flat open iron cooking vessel with a handle, for frying meat, etc., over a fire.

Fuang, a small Siamese money, the half of a salung, equal to about 8 cents.

Fuchsine. See Aniline (Red).

Fucus, a name for many kinds of seaweed, some of which are eaten raw as food by man and beast; while others afford soda, iodine, and glue.

Fuel, any substance used for making a fire to obtain heat, as wood, coal, coke, charcoal, lignite, turf, etc. Many kinds of so-called *artificial fuel* are in use, made of various mixtures, in which coal-dust, coke-dust, sawdust, peat, asphaltum, bitumen, pitch, and other ingredients are employed. They are not very extensively used, except as substitutes for steam-coal on board ship, wherein peculiar qualities are needed. The cost of fuel being a direct element in estimating the relative efficiency of steam-power compared with other sources of power, engineers are directing attention to the capabilities of different kinds of fuel, measured by the quantity of water which the heat from a given weight of fuel will evaporate.

Fulcrum-Forceps, a dentist's instrument, in which one beak is furnished with a hinged plate which bears against one side of the object, while the other beak has the usual tooth or gouge shape. — *E. H. Knight.*

Full-Bound, a book bound with leather.

Fuller, a scourer and cleanser of woollen cloths. — A half-round set hammer, used by blacksmiths for widening out a piece of iron, and condensing the particles thereof.

Fuller's-Earth [Fr. *terre à foulon;* Ger. *Walkererde;* It. *terra da purgatori;* Sp. *tierra de batan*], a species of clay, of a greenish white, greenish gray, olive and olive green, and sometimes spotted color. It is usually opaque, very soft, and feels greasy. It is used by fullers to take grease out of cloth before they apply the soap. The best is found in Buckinghamshire and Surrey, England. When good, it has a greenish white or greenish gray color, falls into powder in water, appears to melt on the tongue like butter, communicates a milky hue to water, and deposits very little sand when mixed with boiling water. The remarkable detersive property on woollen cloth depends on the alumina, which should be at least one fifth of the whole, but not much more than one fourth, lest it become too tenacious. In recent times other substances have frequently been substituted.

Fulling, a process whose invention is lost in antiquity (Fig. 212), by which cloths, stuffs, and stockings are cleansed, scoured, and pressed, to render them stronger, closer, and firmer.

The asperities upon the surface of wool render the spinning of it and the making it into cloth difficult operations. In order to spin wool, and afterward convert it into cloth, its fibres must be covered with a coating of oil, which, filling the cavities, renders the asperities less sensible; in the same way that oil rubbed on the surface of a very fine file renders it less rough. When the piece of cloth is finished, it is carried to the *fulling-mill*, where it is beaten with heavy stampers in a trough full of water in which some fuller's-earth has been mixed, for the purpose of cleansing it from the oil. The clay combines with the oil, which it separates from the cloth, and both are washed away together by the fresh water which is brought to it by the machine. But the scouring of the cloth is not the only object in view in fulling it. The alternate pressure given

by the stampers to the piece of cloth occasions (especially when the scouring is pretty far advanced), an effect analogous to that which is produced upon felt by the hands of the hatter. The fibres of wool which compose one of the threads, whether of the warp or the woof, assume a progressive movement, introduce themselves among those of the threads nearest to them, then into those which follow, and thus, by degrees, all the threads, both of the warp and the woof, become felted together.

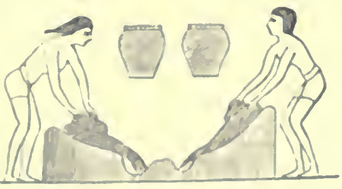


Fig 212. — Fulling in Ancient Egypt
(*From a tomb at Beni Hassan*)

The cloth, after having by this means become shortened in all its dimensions, partakes both of the nature of cloth and of that of felt, and may be cut without being subject to ravel. Lastly, the cloth has acquired a greater degree of thickness, and forms a warmer clothing. Knit worsted also may thus be rendered less apt to run in case a stitch happen to drop. — The fulling-mill is being gradually superseded by the *fulling-machine*, in which rollers perform the operation more quickly and economically than the stocks.

Fulminating Compounds are many in kind, all possessing extremely violent explosive power. Some of them are given under the names of the metals, they being usually metallic salts, more or less complex in character. Among the most powerful and dangerous are the chloride and iodide of nitrogen, the fulminate of silver, and the fulminate of mercury, which is largely used for priming percussion caps. See Percussion-Cap.

Fulwa, a solid oil of vegetable butter obtained in India from *Bassia butyracea*.

Fumier, a French word for dung, or manure.

Fumigation is the employment of vapors of gases extemporaneously extricated for the purpose of destroying contagious or noxious miasmata or effluvia, or to mark unpleasant odors, or to produce a medical action on those parts of the body with which they are brought in contact.

Fuming-Box, in photography, a tight box in which the sensitive paper, after receiving the chloride and nitrate of silver, and before its exposure to light under the negative, is exposed to the fumes of ammonia for having greater depth and brilliancy in the resulting print.

Function, an employment; a duty.

Functionary, one who holds a public office.

Fund, a stock or capital. — Money or income destined to the payment of the interest of a public debt, or for the support of some permanent object. — (Used in the plural.) Money lent to a government, constituting the stock of a national debt, for which interest is paid; as, the *funds* have fallen. See National Debt.

Fund-Holder, an owner of government stock or public securities; one who has property in the funds.

Funded Debt, a permanent loan on which an annual interest is paid.

Fünen. See Denmark.

Fundy (Bay of), an inlet of the Atlantic, sets up between Cape Sable, the S. point of Nova Scotia, and Mount Desert Island, in Maine, a distance of 150 m. The bay is divided, in its N. E. part, into two branches, the N. called Chignecto Bay, the head of which is 170 m. from Eastport. The S. E. part is called the Basin of Mines, 150 m. from Eastport. Passamaquoddy Bay opens into it on the N. W., near its mouth. Gypsum is obtained on the Basin of Mines, and grindstones on Chignecto Bay. This bay is very peculiar; its shores, on both sides, are rocky and abrupt, while near its head the tide, pressed and confined within diminished limits, rushes with much violence over extensive and wide-spread mud-flats, and rises generally 60 feet or more. Its fisheries are valuable and extensive.

Funeral, an interment; a common name for the carriages or procession attending the burial.

Funeral Plume, an elaborately prepared and expensive set of sprays of ostrich feathers mounted on wires for fixing on horses' heads, hearses, or coffin-lid boards.

Funifera Cordage. See Piassaba.

Funnel, a hollow conical vessel, usually of glass, tin, or earthenware, with a pipe at the apex, for pouring liquids into small-mouthed vessels (see Filtration). — The sheet-iron chimney of a steamer, carried to a sufficient height to assist the draught of the furnace.

Funt, the Russian pound weight of 14 oz. 7½ drachms.

Fur, the fine soft short hair on the skin of certain animals inhabiting the colder climates, which is worn for warmth or ornament. In fur-bearing animals the fur lies alongside of another covering, called the *over-hair*. The fur differs from the over-hair in that it is soft, silky, curly, downy, and curled lengthwise, while the over-hair is straight, smooth, and comparatively rigid. These properties of fur constitute its essential value for felting purposes, and mark its difference from wool and silk, the first, after some slight preparation by the aid of hot water, readily unites its fibres into a strong and compact mass; the others can be best managed for spinning and weaving. On the living animal the over-hair keeps the fur filaments apart, prevents their tendency to felt, and protects them from injury, thus securing to the animal an immunity from cold and storm; while, as a matter of fact, this very over-hair, though of an humbler name, is most generally the beauty and pride of the pelt, and marks its chief value with the furrier. We arrive thus at two distinct and opposite uses and values of fur. Regarded as useful for felt, it is denominated *staple* fur, while with respect to its use with and on the pelt it is called *fancy* fur. For the one purpose the Russian hare skin is more valuable than the Russian sable, while for the other the sable may be valued at one thousand times the former. — The history of fur can be read in Marco Polo, as he grows eloquent with the description of the rich skins of the khan of Tartary; in the early fathers of the church, who lament their introduction into Rome and Byzantium as an evidence of barbaric and debasing luxury; in the political history of Russia, stretching out a powerful arm over Siberia to secure her rich treasures; in the history of the French occupation of Canada, and the ascent of the St. Lawrence to its source in Lake Superior, and the subsequent contest to retain possession against England; in the early settlements of New England, New York, and Virginia; in Irving's "Astoria," in the records of the Hudson's Bay Company; and in the annals of the fairs held at Nijni-Novgorod and Leipsic. Here it may suffice to give some account of the present condition of the trade in fancy fur. The collection of skins is now chiefly a matter of private enterprise. Few, if any, monopolies exist. The Alaska Commercial Company, now about twelve years old, enjoys some special privilege for the taking of seal-skins on the Pribiloff Islands, and some peculiar restrictions exist in Russia in relation to certain peltries,

but beyond this, the trade in furs is a free one the world over. Individual enterprise, skill, forecast, and capital have an open field. The Hudson's Bay Company, with its chief office in London, still maintains its organization, but conducts its affairs in North America under no special or royal grant, and competes in the open market with individual traders throughout Canada, Labrador, Manitoba, and Columbia. Its collection of peltries is offered to the highest bidder at public auction in London, in January, March, and September of each year. Private collectors and dealers throughout Canada and the U. States forward their furs to the seaboard, chiefly to New York, for sale there, or for consignment principally to London and to Leipsic. The latter town still maintains the custom of spring and autumn fairs, at which most kinds of wares are sold or exchanged with dealers from Turkey, Austria, and Russia. Nijni-Novgorod is the chief fair for European Russia, though very important fairs are also held in Kasan and in Irbit among the Ural Mountains. The most important fair for Eastern Siberia is held at Kiachta, on the borders of China, where an extensive exchange of furs is carried on with the Celestials. Japan has added but little to the activity or extension of the fur-trade, though her northern shores have furnished many a fine fur seal and sea-otter to the hardy navigator. Staple furs, or those used chiefly in the manufacture of hats, are those of the hare and the rabbit, collected mainly in Russia, Germany, France, and England, dressed, carroted, and cut from the skin in Western Germany, France, Belgium, and England, and thence distributed to the manufacturing centres of the world; and here it may be added that the clippings and cuttings of fancy furs from the workshops of furriers are all saved, and find their way to the machinery, which utilizes the waste, and transforms them into hatters' furs. But of all these fur marts, that of London is the chief, for thither tend, by the laws of trade, not only much of the produce of Asia and Europe, but also the fine peltries of Chili and Peru, the nutria from Buenos Ayres, the fur seal of Cape Horn and South Shetland, the hair seal from Newfoundland, as well as the inferior peltries of Africa. To prepare fur skins in a way to endure this long transportation is a simple and easy matter. When stripped from the animal the flesh and fat are carefully removed, and the pelts hung in a cool place to dry and harden; nothing is added to protect them. Care is taken that they do not heat after packing, and that they are occasionally beaten to destroy worms. A marked exception is the case of the fur seal, which is best preserved by liberal salting and packing in hogsheads. All other raw furs are marketed in bales. — *Kinds and Quantities.* Few kinds of animals furnish a pelt of suitable weight and pliability, and all of them differ widely in elegance of texture, delicacy of shade, and fineness of over-hair, and it is these differences which determine their place in the catalogue of merchandise. These few animals are not very prolific, and many of them attain their greatest beauty in wild and uncultivated regions. To this remark there are some notable exceptions. Being thus few in kind, and limited in quantity, one might fear the extinction of the several choice varieties through the persistent energy of the trapper. But here the fickleness of fashion steps in, and does for the fur-trade what the law of supply and demand does for the more staple articles of commerce. Fashion, fastidious and fickle, neglects the use of certain kinds for a season; the market price of the pelt no longer repays the outfit of the trapper; the hunt is intermitted, and in two or three years the animal regains its numbers and strength. The annual collection of furs is thus a matter of ceaseless change; but the following may be relied on as an estimate correct enough for all practical purposes: —

Average Annual Collection.

Badger	America	5,000
"	Europe and Asia	50,000
Bear	America	15,000
"	Europe and Asia.	4,000
Beaver	Asia	20,000
"	America	200,000
Buffalo	America	100,000
Chinchilla	Peru and Chili	100,000
Cat, Wild		10,000
" House		1,000,000
Ermine	Asia and Europe.	400,000
Fisher.	America	12,000
Fitch	Europe	600,000
Fox, Silver	Asia and America	2,000
" Cross	Asia and America	10,000
" Blue	Europe and America	7,000
" White	Arctic	75,000
" Red	Asia and Europe	300,000
" "	America	60,000
" Gray	America	30,000
" Kitt	America	40,000
Hamster	Europe	200,000
Hare	Asia and Europe	4,500,000
Kolinsky	Asia	80,000
Lamb	Persian	100,000
"	Astrakhan	600,000
"	European	2,000,000
Lion		500
Lyme		50,000
Marten	American	130,000
" Stone	Europe	150,000
" Baum	Europe	60,000
" Russian Sable.		100,000
Mink	America	250,000
"	Russia	50,000
Monkey.	Africa	40,000
Musk-rat	America	3,000,000
"	Russia	100,000
Nutria	South America	3,000,000
Opossum	America	250,000
Otter, Land		40,000
" Sea	North Pacific	5.000
Rabbit	Europe	5,000.000
Raccoon	America	500,000
Seal, Hair	Atlantic	1,000,000
" Fur	Pacific	200,000
Skunk	America	350.000
Squirrel	Siberia	6,000,000
Tiger	Bengal and North	500
Wolf		25.000
Wolverine		3.500

We give here a brief account of the qualities of the pelts, with some general remarks as to their average value and their customary uses.

Badger. — Size, 2 by 3 feet; overhair coarse, 3 to 4 inches long, black with silver spots. The German are the best. Fur woolly. American have softer overhair. Used for robes, military trappings, and brushes. Value of prime, from 50 cents to $1 50 per skin.

Bear, Black. — Size 3 by 6 feet; overhair 6 to 8 inches long, fine, flowing, and glossy; fur thin. Best are American. Used for robes, military caps, and mats. The finest are the cubs. Value of prime, from $5 to $20.

Bear, Brown. — Same size as the black, and very fine in overhair. Found only in the Hudson's Bay territory. Used for muffs and garniture. Value of best prime, $75. Quantity very small.

Bear, Grizzly. — Larger than the black; coarse hair; thick heavy pelt. Only found in western part of the U. States. Used as robes. Value $5 to $10.

Bear, White. — Largest of the bear family; hair short and rigid; pelt thick. Found only in the Arctic regions. The best pure white are used for robes. Value from $50 to $100.

Beaver. — Size 2 by 3 feet; overhair 3 inches long, coarse and brown in color; fur thick, fine, and dark gray. Best are from Labrador and Moon Fort. Used in every form and fashion in all northern countries; highly prized in Russia and China. Value from $1 to $3 per pound in the raw parchment state.

Buffalo. — Size, 8 to 12 feet long; hair coarse, color dun brown. Only found on the western and northern American prairies. Best are from the region of the Saskatchewan River. Prime are used as robes; coarse and unprime as leather for moccasins. Value $3 to $10.

Chinchilla. — Two kinds, real and bastard. Size of real 8 by 12 inches; overhair and fur of equal length, — about $1\frac{1}{2}$ inches long, very fine, and like wool may be spun and woven. Color silver-gray and dark. Best are from Peru. Used for muffs, boas, and borders on garments; value from \$1 to \$3. The bastard are from Chili (chinchilla means the Chilian skin), short in fur, small in size, weak in pelt, and are worth from 10 to 20 cents.

Cat, Wild. — Overhair and fur thin and coarse; color gray; value and uses very limited. Civet cats are sometimes admired for their singular marks, but are in poor demand. House cats are too well known to require a description. Their colors are black, gray, red, and mottled. Best come from Holland, the poorest from Russia. Used very generally for fur-work. Price of best black \$1 to \$2; other sorts nominal.

Ermine. — Size 4 by 10 inches, overhair and fur fine, soft, and close; pelt thin and tough; color pure white, the tip of the tail black. Best are from Barabinsk and Ischim, in Siberia. Used for muffs, garments, and linings. Value variable; the best have been as high as \$1.50, and as low as 15 cents.

Fisher. — Size, 15 by 30 inches; overhair very fine, glossy, dark, and durable, 2 inches long; fur close, tail 12 inches long, bushy, and dark. A right noble skin. Best from British America. Value from \$10 to \$20.

Fitch. — Size about that of the American mink; overhair fine, $1\frac{1}{2}$ inches long, with dark points; fur a golden yellow. Best from Germany, Holland, and Denmark, smallest from Russia. Used for ladies' furs according to the prevalent fashion. Value from 50 cents to \$1.50.

Fox, Silver. — Size, 2 by 4 feet; overhair thick and fine, 3 inches long, varied in color from pale silver to a brilliant blue black; fur fine and curly; its beauty places it at the head of all fancy furs; the tail is a royal brush. The choicest are from Labrador and Moon Fort; those of Russia are more woolly and less valuable. Used for muffs, boas, and linings of robes. Price from \$50 to \$200.

Fox, Cross. — Not quite so large as the silver, with fine overhair, but a shade of red at the points, and from the paleness of the fur making a distinct dark cross at the shoulders. Best are from the Hudson's Bay Territory, and valued from \$10 to \$40.

Fox, Blue. — Size the same as the cross, with gray-blue overhair, and a woolly fur. The finest are from Archangel on the White Sea, and from Greenland. Value from \$10 to \$20.

Fox, White. — Size the same as the cross, with pure white overhair and fur. The best are from Labrador, the poorest from Asia. Value from \$1 to \$3.

Fox, Red. — Well known to all northern nations; abundant in Europe, but in size and beauty inferior to the American family. The former fetch \$1, while those from Labrador are valued at \$4.

Fox, Gray. — Only found in the U. States. Overhair is gray, sprinkled with silver on the back, the sides are yellow, and the tail an ashen gray. — Value from \$1 to \$2.

Fox, Kitt. — Found in northwest America and in Tartary. Overhair fine, the back is a pure gray, the sides yellow, and the belly white. In size it is the smallest of the foxes. Price from 25 to 75 cents.

Hamster. — Size, 3 by 5 inches; hair short and close, back gray and the sides yellow. A great trouble to the farmers in Germany, who spare no pains to exterminate them. The pelt is made into linings for cloaks.

Hare. — Overhair fine, fur very long, fine, abundant, and strong; pelt weak; color gray and white. Best are from Russia. This skin is largely used by furriers, but its fur is among the best for hatters' purposes. Value from 10 to 25 cents.

Kolinsky. — Found only in Asia, and attains the size of the American mink; overhair a golden red, $1\frac{1}{2}$ inches long. The tails make excellent pencils for painters. Value from 50 cents to \$1.

Lamb. — The finest, dark, close-curled skins come from Persia; the next grade from the Crimea, and are gray in color; inferior skins from Astrakhan. All these are used by furriers for caps, borders, and garments. The finest Persian are worth \$3 to \$5, the Crimean \$1.50, and the Astrakhan from 25 to 50 cents. The lamb-skins of western Europe are used for lining gloves. Angora sheep are sometimes in demand, and are colored red, blue, gray, and orange to suit the fashion for fringes and borders. Their value is from \$3 to \$10.

Lion. — The finest from Asia. Specimens are rare, and price variable.

Lynx. — Size, 2 by $3\frac{1}{2}$ feet; overhair fine and flowing, of a clear silver-blue shade, sprinkled with black; length of overhair 3 to 4 inches. Best are from Sweden and Labrador. Value from \$2 to \$5.

Marten, American. — Size from 5 to 15 inches to 8 by 20 inches; overhair fine and flowing, 1 to 2 inches long; fur close and thick; color of best a dark coffee brown, of poorest a pale yellow. The finest are from the Great Whale River and Labrador. Always a choice and valued pelt. Price of best \$25, of poorest 50 cents. The tips of the tails are highly prized for artists' brushes.

Marten, Stone. — Found in Europe; the best from Hungary and Turkey. Color a dull gray, overhair coarse, and fur woolly. Value of best prime, \$2 to \$3.

Marten, Baum. — Found in Europe and Asia, of fine overhair, but woolly fur, of a brownish color, approaching that of the American marten, and furnished with a long and bushy tail. Value from \$5 to \$10.

Marten, Russian Sable. — These skins are in the highest estimation with furriers. Size about the same as the American marten, but the overhair is much more fine and flowing, of a rich bluish dark shade, and from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long; the pelt is very soft, tough, and durable. The best are from Yakutsk in Siberia, the next from the Lena River, and the poorest from the Lower Amoor. Very choice grades, but of a browner shade, are furnished by Kamtchatka. Value of the poor Saghalien from \$1 to \$2, while the darkest from Okhotsk will command \$150.

Mink, American. — This valuable skin has nearly the size of the marten, with an overhair that is shorter and slightly more rigid, but vies with the marten in elegance of lustre, the choicest having a dark blue shade that is always admired in furs. The best are from Nova Scotia, the State of Maine, and the Labrador coast. It is most abundant in the middle and northwestern States. Value of the best, from \$3 to \$10.

Mink, Russian. — Of smaller size than the American, and inferior in all other respects, but still a valuable pelt. Price of prime, from 50 cents to \$1.50.

Monkey. — From the west coast of Africa, has a long, thin, flowing hair; of various colors, chiefly black and dun gray. Has a limited use with furriers, fetching from 50 cents to \$1.50.

Musk-Rat. — A well-known fur in the U. States. Size 8 by 12 inches; overhair coarse and light brown; fur fine, thick, and silky; in general favor with furriers, and available for a great variety of purposes. Best are from New England and New York; very prolific in cultivated regions. The price is very fluctuating, and as the annual collection varies from three to five millions of skins, it is difficult to forecast the market value. Price for prime, from 12 to 75 cents. A variety of black-colored musk-rat from Delaware and Maryland fetches double these prices.

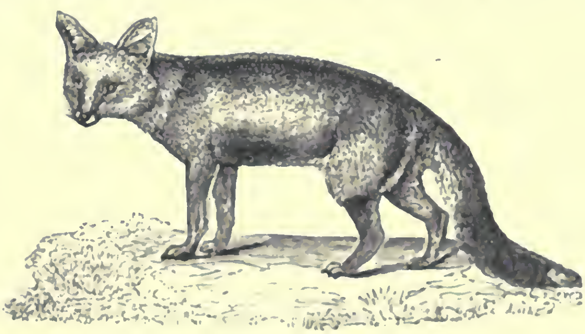


Fig. 213. — Fox.

Nutria. — From the La Plata, South America; in size and value between the beaver and the musk-rat; overhair coarse and rigid; fur short and fine; pelts too often unsound, and hence the value of the fur is chiefly for hats. Price of dry skins from 25 to 50 cents per pound.

Opossum. — Chiefly from the U. States, but some also from Australia. Overhair long, coarse, and whitish gray; fur woolly. Best from Ohio. Value from 10 to 50 cents.

Otter. — Comes from all northern countries. Size of best, 2 by 5 feet; overhair thick and close; color brown black. Best are from Labrador and Canada. The skin is in high reputation and general use with furriers. Value of best, \$7.50 to \$15.

Otter, Sea. — Found only in the North Pacific Ocean, on the coasts of Alaska, Kamtchatka, and Japan. Size, 2 by 6 feet; overhair exceedingly fine, and extending but little beyond the fur, which itself is very thick, close, fine, and silky; color dark brown, occasionally with silver points regularly interspersed; pelt pliable and firm. The poorest skins are not more valuable than those of the beaver, but the fine choice specimens command from \$100 to \$500. They are in high repute with the Russians and Chinese.

Rabbit. — Size, 10 by 16 inches; fur thick and fine; pelt weak; color all shades from black to white. Best are found in England, but the purest come from Poland. The best colored skins are used by furriers, but much the larger portion is cut for hatters' fur. The animal is largely bred in warrens, and its flesh used as food; the pelts thus become of secondary importance, and, being abundant, supply a cheap fur.

Raccoon. — One of the peculiar and valuable pelts of the U. States, and flourishing best in cultivated regions. Size, 1 by 2 feet; overhair not fine, but bright in color, 3 inches long, thick, and flowing; fur resembling that of the beaver; color from silver blue to gray brown and coffee brown. Best are from Michigan and Ohio. Average value of prime, $1. Some specimens vie with the fisher in its peculiar shade, and some even with the silver fox, and such rare skins bring from $5 to $20.

Seal, Hair. — Chiefly from the North Atlantic. Size from 3 to 10 feet; hair coarse and rigid; no fur; divided into white coats, blue-blacks, mottled, and ordinary. Used for saddlery and military purposes. Average price, 50 cents.

Seal, Fur. — Found only in the Pacific and in the South Atlantic. Size of the wigs, 4 by 8 feet; of the large, 3 by 6 feet; middling, 2½ by 5 feet; small, 2 by 4 feet; the pups vary in length from 2 to 4 feet. Overhair coarse and rigid; fur fine, thick, silky, and very uniformly distributed. Pelt thin, pliable, and of light weight. The largest number come from Alaska, whence 100,000 are allowed by law to be brought annually. The best of these are the prime middling pups Value varies from $5 to $15 in the salted state. A few fine skins come from the coast of British Columbia, and being caught in winter are in prime condition. The choicest skins are taken on the South Shetland and South Georgia Islands in the Antarctic Ocean Fur fine beyond comparison; pelt very pliable, light and thin and firm. Value, salted, from $10 to $50.

Skunk. — Another peculiar production of the U. States. Size, 10 by 16 inches long, overhair fine, 3 inches long, dark blue and coffee brown, thick, glossy, and flowing. Many have two white stripes, more or less broad, extending from the head to the tail. It is now easy to deodorize the skin, and the fur is a popular one in all countries. The best are from New York and Ohio; value of best prime black, from $1 to $2.50.

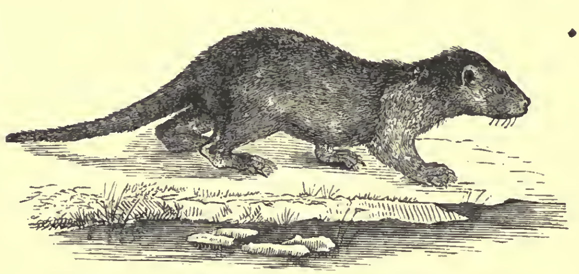


Fig. 214. — Otter.

Squirrel. — Only those of northern Europe and Asia have a value as merchandise. American are worthless. Size 3 by 6 inches; overhair and fur equally fine; color from pale blue to clear dark blue; best are from Eastern Siberia; palest and poorest from European Russia; bellies white; tails long and bushy. This fur is in universal demand among furriers for muffs and linings, as well as for large garments Pelt pliable and tough; fur durable, close, and fine. The tails are made into boas and brushes.

Tiger. — Specimens are rare. Those from Bengal are large and short in hair, but well marked; while those from Northern China have hair 2 to 3 inches long, and frequently measure 10 to 14 feet in length. Value of the latter, from $50 to $100.

Wolf. — The largest are from Labrador, measuring from 4 to 6 feet long, chiefly gray-brown in color, with long, flowing, coarse overhair. The finest are from Fort Churchill, and fetch a high price. The American prairie-wolf is a variety inferior in every respect. Price of best, $10; of the inferior, $1. The wolf is very destructive of the fur-bearing animals, and is an object of extermination with all trappers.

Wolverine. — From Russia, Norway, and Hudson's Bay. Color a clear dark brown, overhair coarse, 2½ inches long. Value from $3 to $6.

Of the fur-bearers, those that seek their food in water have their finest but shortest fur on the belly, and longer fur upon the back; while those that avoid the rivers have their longest and finest fur upon the back, and their bellies clothed with fine, long, flowing overhair. — *Dressing.* Raw furs are made ready for use by softening the pelt with pure butter or sweet oil, trampling them in tubs filled with fine hardwood sawdust at about blood-heat, drawing the pelt over a sharp knife to remove every particle of flesh, and finally trampling them again in clean sawdust. The pelt thus becomes soft and pliable, like the fine kid used for gloves. They are then ready for the furrier, who assorts the skins as to color and overhair, and cuts them in various ways to bring them to the pattern of the article required. Having been sewed together with a close, fine overseam, the article is damped, and stretched upon a smooth pine board after a pattern marked, then nailed along its edges and left to dry. After removal from the board the article is trimmed, and softened by rubbing, and is then ready for the liner. The skill of the furrier lies in the taste exhibited in the arrangement of the furs, and in the economy of use of material. — *Dyeing.* Furs are dyed in a variety of ways to make them uniform in color, and adapt them to the fashion and taste of the time. Ordinarily this is a cheap and ready process, and only becomes an art when employed upon fine skins, from which the overhair has been first removed by plucking, leaving the fur alone to receive the dye-stuff. Among these are the skins of the musk-rat, beaver, otter, and especially the fur seal; the last has received very careful attention, as its entire value depends upon the perfection and success of the process. Unprime fur seals part with their overhair very reluctantly, while the seasoned skins are very readily unhaired, leaving the fur in all its smoothness; thus the best grades are likely to be very good, while the rest rank only from ordinary to very common. A subsequent process is the removal of all grease from the fur, which is effected by repeated washings in softened water; if this is imperfectly done, the color will be uneven and not permanent. The final work is to prepare a dye of suitable strength, and apply it in a suitable way, to infuse the coloring matters into the fur, without suffering too much of it to reach the pelt, whereby its durability might be ruined. London claims to have accomplished this for the seal-skin in a manner that distances all competition; and it certainly enjoys a wide popularity, as well as the substantial fruits of the sale of its production of colored seals. But America also has its successful dyers of seals, one of the most important of the results we have achieved being the giving to the fur seal a fine deep brown color, without injuring or burning the fur, while leaving the pelt soft, light, and durable. — *Prices of Fancy Furs.* The market value of dressed and manufactured furs is at the mercy of fickle fashion and the weather. The production of any one variety is very limited, and consequently those that are in fashion during a cold winter command full and even extravagant prices, while others, of equal intrinsic merit, have a merely nominal value. The consumer is not more responsible for this than are the furrier and the fur merchant. It was the remark of an old and successful fur-dealer that "furs when wanted are diamonds, when not wanted are charcoal." This fact renders the trade an extremely hazardous one, and tends to make the venture in it a matter of speculation rather than of provident enterprise; and while the consumer occasionally may have to pay a very extravagant price for some few varieties of furs for a short period, it happens far more frequently that the fur-dealer is a severe sufferer by reason of sanguine anticipations of advance in values, which in nine cases out of ten are doomed to disappointment.

For further information, see the excellent work "Fur and the Fur-trade," by M. M. Backus (Little, Brown, and Co., Publishers, Boston, 1879), from which the foregoing is borrowed.

Our foreign trade in furs for the year 1878 was as follows: Imports of undressed skins (chiefly from England and the Canadas), $1,714,066; imports of furs and dressed fur skins (mostly from England, France, and Germany), $2,230,204. Exports of furs and fur skins (mostly to England and Germany) $2,618,100.

Imp. duty: caps, hats, muffs, tippets, and all manuf. of fur, or of which fur shall be a component (including coney-plates), 35 per cent. — Hares' furs, undressed and not on the skin, 20 per cent. — Hatters' furs, not on the skin, and dressed furs on the skin, 20 per cent. — Fur skins of all kinds not dressed in any manner, free.

Furbelow, a plaited border; the flounce for a dress.

Furbisher, a burnisher or polisher.

Fur Cap, a seal or other skin cap.

Fur Coat, a wrapper for cold weather made of bear-skin, beaver, seal, or other fur.

Fur-Cutting Machine, a mechanical contrivance for shaving peltries at the back of the skin, so as to loosen the long hairs, leaving only the fine under-fur.

Furdingar, a liquid measure of Finland, about 7½ pints, the fourth part of the tunna.

Furling, in naval parlance, the wrapping or rolling a sail up snugly to the yard or boom, and binding or securing it.

Furlong, an English measure of length, 40 poles, the eighth part of a mile.

Furnace, an apparatus to contain combustible matter, and supplied with air in various ways to facilitate its combustion and produce heat, which is directed upon an object in the vicinity, such as an ore or metal under treatment, a steam-boiler, etc. *F.* are constructed according to many different patterns, with varying degrees of complexity in arrangement, but all may be considered as combining three essential parts, namely, the fireplace in which the fuel is consumed; the heated chamber, laboratory, hearth, or working-bed, as it is variously called, where the heat is applied to the special work for which the *F.* is designed; and the apparatus for producing rapid combustion by the supply of air under pressure to the fire. In the simplest cases the functions of two or more of these parts may be combined into one, as in the smith's forge where the fireplace and heating chamber are united, the iron being placed among the coals, only the air for burning being supplied under pressure from a blowing engine by a second special contrivance, the tuyere, tuiron, twyer, or blast-pipe; but in the more refined modern *F.*, where great economy of fuel is an object, the different functions are distributed over separate and distinct apparatus, the fuel being converted into gas in one, dried in another, and heated in a third, before arriving at the point of combustion in the working-chamber of the *F.* proper. The most obvious distinction that can be used in the classification of *F.* is founded on the method adopted for supplying air, which may either be blown into the fire, under a pressure above that of the atmosphere sufficient to overcome the resistance presented by the packed columns of fuel and other materials to its free passage, or be drawn through it by a partial vacuum in a chimney formed by the heated gases on their way to the atmosphere. The former are known as *blast furnaces*, and the latter as *chimney, draught, air*, or *wind furnaces*.

Furnished, a term applied to anything completed or having the necessary appurtenances; a house which is properly filled with necessary goods, upholstery, cabinet-ware, culinary utensils, and garniture; fit for occupation.

Furniture Japanner and Polisher, a workman who oils, varnishes, and prepares for sale new cabinet articles, and cleans and polishes old worn pieces of room furniture.

Furniture-Polish, see French Polish.

Furniture-Printer, a maker of fabrics for covering articles used in rooms.

Furniture-Woods, hard, ornamental woods, used for cabinet-work.

Furrier, a dealer in skins; a manufacturer and vender of various articles of fur.

Furriery, furs in general; the trade in furs.

Furring, fixing thin scantlings on the edges of timber to make the surface even. — Double planking the sides of a ship. — Incrusting a boiler with a scaly deposit.

Furrow, the trench made by a plough. — The grooves in the face of a millstone.

Fur-Trade. See Fur.

Fur-Waste, the clippings and refuse of fur manufacturers' shops, which are imported in bales from England and France and used in the manuf. of felting-cloths.

Fuse, a case of wood or metal charged with an explosive composition, and having a slow match attached for firing a shell or blast charge.

Fusee, the conical part of a watch or clock, round which the chain or cord is wound (see C in Fig. 27, and B in Fig. 83). — A lighted or slow match used by smokers for igniting tobacco.

Fusee-Engine, a clock-maker's machine for cutting and shaping fusees.

Fusel Oil, a strong-smelling oil, produced along with alcohol during the fermentation of grain, potatoes, etc., on the large scale, and which gives the peculiar and disagreeable flavor and odor to raw whiskey. It is found chiefly in the last portion of the spirit which passes over, called the "faints," to which it imparts its characteristic odor and flavor. By rectifying the faints at a very gentle heat, most of the alcohol and water first pass over together with only a little fusel oil, whilst the latter forms the residuum in the still. It essentially consists of hydrated oxide of amyl, but trifling and variable quantities of other organic compounds are mixed with it, which slightly modify its character, more particularly its odor and flavor. The oil of potato spirit is the purest form of crude fusel oil. The exertions of the distiller are directed as much as possible to lessen the formation of fusel oil during the fermentation of his "worts," and to eliminate, during the distillation and rectification of his liquors, the greatest possible proportion of that with which they may be contaminated. Fusel oil is a nearly colorless volatile liquid, with a rather high boiling-point, a durable, penetrating, offensive smell, and an acrid, burning taste; when swallowed, it occasions nausea, giddiness, headache, etc.; in slightly larger quantities, vomiting, delirium, oppressive respiration, and lessened sensibility to pain; its vapor also produces these effects. In quantity, it is a narcotic poison. The greater intoxicating power of whiskey, more especially that from raw grain, than other spirit is due to the larger quantity of fusel oil which it contains. *Imp.* duty $2 per gallon.

Fuse-Setter, an implement used by miners for driving home wooden fuses.

Fusible Metal, an alloy of bismuth, lead, and tin, which melts at a surprisingly low temperature. Different degrees of fusibility are obtained by varying the proportions as follows: 1. Bismuth, 2 parts; lead, 5 parts; tin, 3 parts. Melts in boiling water. 2. Bismuth, 8 parts; lead, 5

parts; tin, 3 parts. Melts below 212° F. 3. Bismuth, 8 parts; tin, 4 parts; lead, 5 parts; antimony, 1 part. The metals should be repeatedly melted and poured into drops, until they are well mixed. 4. Lead, 3 parts; tin, 2 parts; bismuth, 5 parts. Melts at 197° F. 5. To the last, after removing it from the fire, add of quicksilver (warm) 1 part. Liquid at 172°, solid at 140° F. The first four of the above are used to make *toy-spoons*, to surprise children by their melting in hot liquors. A little mercury may be added to lower their melting points. Nos. 2 and 3 are specially adapted for making *electrotype moulds*. The beautiful casts of the French medals known to all electrotypers as Clichée moulds are in the alloy No. 3. The above alloys are also used to form *pencils* for writing on asses' skin, or paper prepared by rubbing burnt hartshorn into it, etc.; also as a *metal bath* in the laboratory. The last is used for *anatomical injections*.

Fusil, a light musket of an antiquated pattern.

Fusing-Point, see FUSION.

Fusion, a melting; the converting of a solid into a liquid by heat. The liquefaction of ice may be called either fusing or melting. Thus 32° F. may be called the fusing or melting point of ice, the freezing or solidifying point of water. The fusing points of the more refractory substances are only to be ascertained approximately on account of the doubtful accuracy of the indications given by the *pyrometers* at very high temperatures. The pyrometer constructed of platinum is the most delicate, although the rate of its expansion must be uncertain as it approaches its own fusing point. The following are considered to be the fusing points of metals:

Platinum	F 3080°	Silver	F. 1830°
Wrought iron	2910	Zinc	700
Steel	2500	Lead	590
Gold	2190	Bismuth	500
Cast iron	2100	Tin	450
Copper	1920		

A dull red heat is estimated as 1480°; a bright red heat as 1830°; and a white heat as 2370° to 2910°, F.

Fusta [Sp.], a small vessel with lateen sails; a kind of woollen cloth.

Fustian [Fr. *futaine;* Ger. *Barchent;* It. *fustagno;* Sp. *fustan*] is a species of coarse, thick tweeled cotton, and is generally dyed of an olive, leaden, or other dark color. Besides the common fustian, which is known by the name of pillow (probably pilaw), the cotton stuffs called corduroy, velverett, velveteen, thick-set used for men's wearing apparel, belong to the same fabric. The commonest kind is merely a tweel of four, or sometimes five leaves, of a very close stout texture, and very narrow, seldom exceeding 17 or 18 inches in breadth. It is cut from the loom in half pieces, or ends, as they are usually termed, about 35 yards long, and after undergoing the subsequent operations of dyeing, dressing, and folding, is ready for the market. Of velvet, there are properly only two kinds, — that with a plain, and that with a tweeled, or, as it is here called, a Genoa ground, or back. When the material is silk, it is called velvet; when cotton, velveteen; and this is the sole difference. In the same way a common tweeled cloth, when composed of silk, is called satin; when of cotton, fustian or jean; of woollen, plaiding, serge, or kerseymere; and in the linen trade is distinguished by a variety of names according to the quality or fineness, or the place where the article is manufactured.

Fustic [Fr. *bois jaune;* Ger. *Gelbholz, Fustic;* It. *legno giallo de Brasilio;* Sp. *palo del Brasil amarillo*], a dye-wood, the produce of a large tree, a species of mulberry (*Morus tinctoria*), a native of tropical America and the West Indies; the best being that of Cuba. It is of a sulphur-color with orange veins, hard and strong, and is imported in the form of logs or large blocks. Its decoction dyes woollens yellow of different shades, according to the "mordant." Alum, tartar, and spirits of tin brighten the tint; acetate and sulphate of iron and common salt darken it; with sulphate of iron it gives olives and browns; with the indigo vat and sulphate of indigo, green. These colors are very permanent. Its yellow turns on the lemon when pale, and on the orange when darker. 1 lb. of old fustic will dye 3 to 5 lbs. of wool. Zante, or *young* fustic, is really a species of sumach (*Rhus cotinus*), and is quite distinct from the *Morus tinctoria*, or *old* fustic; the latter being a large American tree, while the former is a small European shrub. It grows in Italy and the South of France, but is principally exported from the Ionian Islands and Patras in the Morea. It gives a yellow, turning on the green, but its colors are not very permanent. It is chiefly used in combination with other dyestuffs. It is conveniently stowed among a cargo of dry-goods, as it may be cut into pieces of any length without injury. Only a small quantity of this species of sumach is imported. Its price fluctuates considerably. *Imp.* (in stocks) free.

Fut, the French name for a cask, a vessel for liquids; a stock for a gun, or tool; a bookbinder's plough.

Futaille (Fr), a cask of any kind for wine, water, or provisions.

Futainier (Fr.), a fustian-weaver.

Futfaill, Futfell, a name in Scotland for the dressed skins of a slink lamb, or one prematurely dropped.

Futtocks, in a ship, the timbers raised over the keel, or the encompassing timbers which form her breadth and capacity. *Futtock plates* are iron plates crossing the sides of the top-rim perpendicularly. The dead-eyes of the topmast rigging are fitted to their upper ends, and the futtock shrouds to their lower ends.

Fyke, a bow-net for catching fish.

G

Gab, the hook on the end of an eccentric rod, opposite the strap.

Gabarage, coarse packing-cloth; a term formerly used for the wrappers in which Irish goods were packed.

Gabardine, a coarse smock-frock, or blouse.

Gabare, a French lighter; a fishing-boat; a kind of net.

Gabbart, a name in Scotland for a canal barge or lighter.

Gabelle, a tax formerly levied upon salt and other provisions.

Gabilla, a finger or parcel of tobacco in Cuba, consisting of about 30 or 40 leaves. The bales are usually made up of 80 hands, each of four gabillas.

Gad, a small iron punch, with a wooden handle, used by miners to break up ore. — A jumper; a boring-bar. — In Scotland, a fishing-rod; a bar of metal.

Gadesden-Pan, an evaporating sugar-pan, named after the inventor.

Gaeta. See ITALY.

Gaff, a spar to which the head of a fore-and-aft sail is bent. — In Scotland, a sort of net.

Gaff-Topsail, a light sail set over a gaff.

Gage, a pawn or pledge. — A token. — The depth of water displaced by a ship; also the position of a ship in relation to the wind with another vessel, as weather-gage, lee-gage. — The width of a railroad track (see RAILROAD GAGE). — Fine mortar with an addition of plaster of Paris for a finishing coat. — Any instrument used to measure. (See GAUGE.)

Gage-Cock, one of two or more stopcocks which are screwed into the boiler of a steam-engine, one above the level at which water ought to stand in the boiler and the other below it. The ejection of steam and water respectively from the cocks indicates the water-level in the boiler to be between the two gage-cocks. Steam from both shows the water to be too low. Water from both shows the water to be too high. — *E. H. Knight.*

Gagger, a lifter used by the founder, consisting of a light T-shaped piece of iron.

Gag-Rein, in saddlery, a rein which, passing over runners attached to the throat-latch, draws the bit up into the corners of the horse's mouth when pulled upon.

Gain, profit; overplus in a computation. — A mortise. — A bevelled shoulder of a binding-joist to strengthen the tenon.

Gainings, the acquisitions made by successful trade.

Gainier [Fr.], a maker of sheaths or cases.

Gaiter, a covering of cloth or leather for the lower portion of the leg and ankle, fitting closely to the shoe; also a sort of high shoe covering the ankle-joint.

Gala, a great entertainment. — A Scotch cotton fabric.

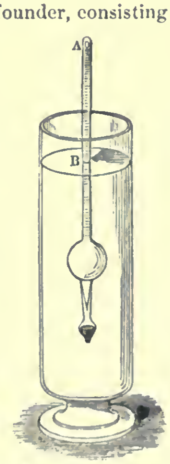


Fig. 215. — GALACTOMETER.

Galactin, a nutritious milky substance obtained from the sap of the *galactodendron*, the milk or cow tree of South America.

Galactometer, Lactometer, an aerometer or glass instrument (Fig. 215), for testing the density of milk, consisting of a stem, enclosing scales; of a cylinder serving to float it, and of a bulb charged with shot, serving as a ballast, so that the instrument floats upright in the milk. It is centesimally graduated.

Galam-Butter, a reddish-white solid oil obtained in India and Africa from the *Bassia butyracea.*

Galangal, a commercial name for the rootstocks of the *Alpinia galanga*, and *A. racemosa*, which have the same properties as ginger. The roots are imported from China, Sumatra, and Java. *Imp.* free.

Galatz. See ROUMANIA.

Galbanum, a gum-resin derived from an unascertained umbelliferous plant. It is brought from Turkey and the East Indies in irregular tears about the size of a pea, usually agglutinated into masses; of a greenish-yellow color, translucent, having a strong disagreeable odor, and an acrid bitter taste. Its properties are similar to the other fetid antispasmodic gum-resins. It ranks between assafœtida and ammoniacum.

Galena, Lead-Glance, Blue-Lead [Fr. *plomb sulfuré;* Ger. *Bleiglanz*], a native sulphuret of lead, which usually occurs in heavy, shining, black, or bluish lead-colored cubical masses. It is the richest ore of lead, and nearly all the lead of commerce is obtained from it. It is used in the form of powder, called *alquifoux*, for glazing pottery. Immense deposits of it exist in Missouri, Illinois, Iowa, and Wisconsin, especially near *Galena*, a thriving city of Illinois, which owes its prosperity to its rich mines of lead.

Galiot, Galliot, a light galley, a Dutch ship.

Galipot, white-pine resin; the residue of the turpentine which has lost its volatile oil by spontaneous evaporation; when purified, it is called Burgundy pitch.

Gall, the bitter fluid secreted by the liver; ox-gall is used for scouring cloth; and when refined, by artists to fix chalk and pencil drawings before tinting them. See GALLS.

Galleon, a large four-decked vessel formerly used by the Spaniards in trading to South America.

Gallery, in mining, an underground excavation, vertical or horizontal. — A long narrow room in the wing of a building. — The upper places or seats in a church or theatre. — A raised balcony or walk in a room. — A railed projection at the stern or quarter of a ship.

Galley, a printer's long frame with a ledge (Fig. 216), on which the compositor empties the contents of his stick as often as it is filled, so that the composed lines, or arranged letters, may be made up into columns or pages; there are newspaper, book, and job galleys. — The place set apart for the fire-hearth and the use of the cook in a ship. — A long sharp boat for a ship's use, carrying from 10 to 12 oars.

Fig 216. — COMMON GALLEY.

Gallic Acid, a peculiar acid obtained from gall-nuts, divi-divi, and other vegetable substances,

rich in tannin. It forms small, feathery, and nearly colorless crystals, which have a beautiful silky lustre; that of commerce is usually of a pale yellow color; it is soluble in 100 parts of cold water and 3 parts of boiling water; it is also soluble in alcohol, and slightly so in ether; the aqueous solution is decomposed by exposure to the air; dissolved in hot oil of vitriol, it forms a deep, rich, red solution, which, when thrown into water, drops the gallic acid, deprived of some of its water. This substance is soluble in the alkalies, and dyes cloth like madder. When strongly heated, gallic acid is converted into metagallic acid, or into pyrogallic acid, according to the manner in which the heat is applied. Its principal use is in the art of photography. It has been also employed in medicine, as an external astringent, but is, for that purpose, greatly inferior to tannic acid. *Imp.* duty, $1 per lb.

Gallipoli. See ITALY, and TURKEY.

Gallipot, a small white earthenware pot or jar, used by chemists, etc.

Gallivat, a large rowing boat in the East Indies.

Gallon, the unit measure of capacity, consisting of 231 cubic inches = four quarts, or eight pints. This, the Winchester gallon of England, is the standard or wine gallon of the U. States, and also of the East and West Indies. The standard British measure, both for liquid and dry articles, is the *Imperial gallon*, which consists of 277.274 cubic inches, and should contain 10 lbs. avoirdupois of distilled water. In dry measure it is the eighth of a bushel.

Galloon, a narrow thick ferret or lace, commonly made of mohair or silk; but sometimes of wool, thread, gold, or silver. It is used as edging, and the common kinds are largely employed for binding hats, shoes, etc.

Gallo-Tannic Acid, a name for the pure tannin of nut-galls employed for chemical purposes.

Gallows, the frame supporting the beam of a steam-engine. — In printing, the rest for the tympan when open. — A beam laid over two posts, on which criminals are hanged.

Gallows-Bitts, a strong frame in the centre of a ship's deck to support spare spars when in port.

Galls, Gall-Nuts, Nut-Galls [Fr. *noix de galle;* Ger. *Gallapfel;* It. *galle;* Sp. *agallas*], are excrescences produced by the attacks of a small insect, which deposits its eggs in the tender shoots of a species of oak (*Quercus infectoria*), abundant in Asia Minor, Syria, Persia, etc. Galls are inodorous, and have a nauseously bitter and astringent taste. They are nearly spherical, and vary in magnitude from the size of a pea to that of a hazel-nut. When good, they are of a black or deep olive color; their surface is tubercular, and almost prickly; they are heavy, brittle, and break with a flinty fracture. They are known in commerce by the names of *white*, *green*, and *blue*. The white galls are those which have not been gathered till after the insect has eaten its way out of the nidus and made its escape. They are not so heavy as the others, and are of a lighter color, and do not fetch so high a price. The green and blue galls are gathered before the insect has escaped; they are heavier and darker than the former, and are said to afford about one third more of coloring matter. Galls are of great importance in the arts, being very extensively used in dyeing, and in the manufacture of ink, of which they form one of the principal ingredients. They are the most powerful of all the vegetable astringents; and are frequently used with great effect in medicine. Galls consist principally of three substances, — tannin or tannic acid, yellow extractive, and gallic acid. The decoction has a very astringent and unpleasant bitter taste. The ancients reckoned the gall-nuts of Syria superior to every other, and they still retain their pre-eminence They are principally exported from Aleppo. Tripoli, Smyrna, and Said. Those from Caramania are of a very inferior quality. It is not unusual to dye the whitish gall-nuts blue, in order to increase their value. The fraud is, however, detected by the deeper blue tinge that is thus imparted to them; and by their being perforated and lighter than the genuine blue galls. *Imp.* free.

Gall-Stone, a calcareous concretion found in the gall-bladder of animals; it is sometimes used by painters as a yellow coloring matter, on account of its brightness and durability.

Gallygaskins, leather protectors for the legs of sportsmen during shooting excursions, etc.

Galoche, an overshoe; also, gaiters extending from the knee, and covering the instep.

Galvanic Battery. If we take a vessel containing water, to which some sulphuric acid has

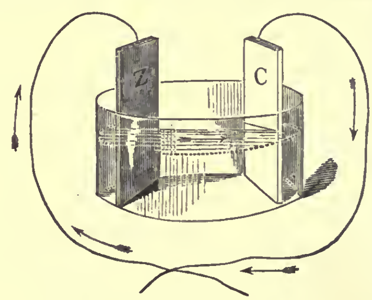


Fig. 217. — GALVANIC BATTERY.

been added (Fig. 217), and plunge in the liquid a plate of copper, C, and a plate of *pure* zinc, Z, keeping the plates apart from each other, no action will be perceived, nor gas will be given off,

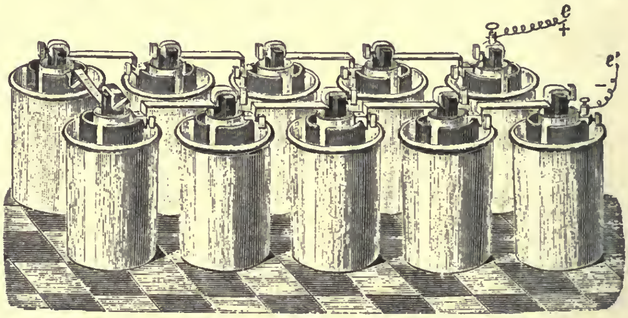


Fig. 218. — BUNSEN'S COMPOUND BATTERY.

nor will the zinc dissolve in the acid. But if the two plates be made to touch each other, or if a wire be attached to each plate, as shown in the figure, and the wires be brought into contact outside of the vessel, an action in the liquid is immediately perceptible at the surface of the *copper* plate, when a multitude of small bubbles of hydrogen gas will at once make their appearance, and the gas will

be given off continuously from the copper plate so long as there is metallic contact through the wires, or otherwise, between the two plates, or until the acid is saturated with zinc, — for in this action the zinc is dissolving, and, in consequence, liberating hydrogen, which strangely makes its appearance, not at the place where the chemical action really occurs, namely, at the surface of the zinc which is in contact with the acid, but at the surface of the copper which is not acted upon by the acid. The zinc, communicating its natural share of the electrical fluid to the acid, becomes *negatively* electrified. The copper, attracting the same fluid from the acid, becomes *positively* electrified, and any conductive substance, as the wires, placed within the line of communicating between the positive and negative points, will receive the charge thus to be obtained. It is known that when we establish a metallic communication between two bodies charged with equivalent quantities of positive and negative electricities respectively, these combine and neutralize each other, and all signs of electricity vanish. It is obvious that the contact of the two wires has this effect, as the signs of electric charge which were before discoverable in each of the plates are no longer found while the wires are in contact. But the charges reappear the instant the contact is broken, the chemical action ceasing at the same time. The arrangement of metals and acid which we have described is termed a *galvanic* (or *voltaic*) *couple*, *element*, or *cell*; and a series of cells joined together, as in Fig. 218, is a *galvanic battery*. A single cell is, however. commonly termed *battery*, while the term *compound battery* is given to a series of cells. See ELECTRO-METALLURGY, TELEGRAPH, etc.

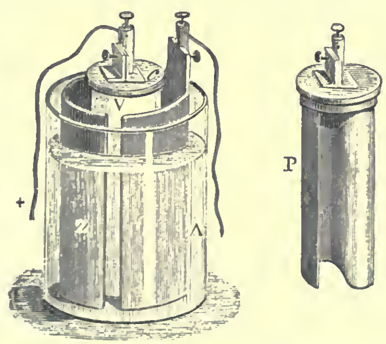


Fig. 219. — GROVE'S BATTERY.

Grove's Battery (Fig. 219) is the most energetic battery yet known, and is the one most generally used for the magnetic telegraph. The metals employed are platinum and zinc, and the solutions are strong nitric acid in contact with the platinum, and sulphuric acid diluted with ten or twelve parts of water in contact with the zinc. This battery must be used with great care, on account of the strength of the acids used for the solutions, which send out injurious fumes, which are destructive to organic substances. The containing vessel, A, is glass; within this is a thick cylinder of amalgamated zinc, Z, standing on short legs, and divided by a longitudinal opening on one side, in order to allow the acid to circulate freely. Inside of this is a porous cell of unglazed porcelain, V, containing the nitric acid and strip of platinum. The platinum (shown separately in P) is fixed to a cover, *c*, which is placed on the porous cell The amalgamated zinc is not acted upon by the diluted sulphuric acid until the circuit of the battery is completed. But, as the nitric acid will filter through the porous cell and act upon the zinc, it is advisable to remove the zinc from the acid when the battery is to remain inactive. *Bunsen's battery* differs only from this in the substitution of carbon to the plate of platinum. The Grove's and Bunsen's batteries are much more powerful arrangements than Daniell's (see ELECTRO-METALLURGY, Fig. 158), but the latter has the advantage as regards the duration and uniformity of its action.

Galvanized Iron, iron tinned by a peculiar process, whereby it resists the rusting influence of damp air, and even moisture, much longer than ordinary tin plate. It is made in corrugated sheets, and ranges from 800 sq. feet per ton, to 2,170 feet or more. It is either curved, step-corrugated, or corrugated with small flutes or channels.

Manuf. Clean the surface of the iron perfectly by the joint action of dilute acid and friction, plunge it into a bath of melted zinc, covered with sal-ammoniac, and stir it about till it be alloyed superficially with this metal; when the metal thus prepared is exposed to humidity, the zinc oxidizes slowly by the galvanic action, and protects the iron from rusting within it, whereby the outer surface remains for a long period perfectly white, in circumstances under which iron tinned in the usual way would have been superficially browned and corroded with rust.

Galvanoglyphy. See GLYPHOGRAPHY.

Galvanometer, an instrument constructed to measure minute quantities of electricity in galvanic operations.

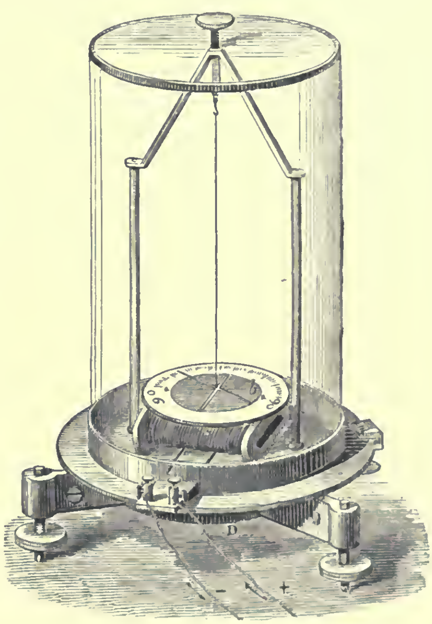


Fig. 220. — GALVANOMETER.

A conductor traversed by a current, and placed above a magnetic-needle, but very near to it, and parallel to its axis, causes the needle to turn to the east or west, according as the current is moving from north to south, or south to north. If the wire is placed below the needle and parallel, as before, the effect is reversed. It follows, then, that when the conductor passes first above and then below the needle, so as to form two parallel lines between which the needle is suspended, the action of the current upon it will be similar in both cases; and the force thus produced is twice as much as that produced by a single conductor. By increasing the number of coils, the action of the current upon the needle can be so increased that very feeble currents can readily be detected. The conducting wire used must of course be insulated to prevent any direct metallic communication between the coils. There are several forms of *G*. The *astatic G.*, represented in Fig. 220, consists of an astatic needle placed in a coil of wire, so that the lower needle is within the coil, and the upper one above it. Its deflections are more considerable than those of a simple needle.

Galvanoscope, an instrument for detecting slight currents of electricity. Its construction is the same as that of the galvanometer, but, being used only to detect the presence of a current, it has no provision for measuring its strength or amount.

Galveston. See TEXAS.

Galveston, Harrisburg, and San Antonio R.R. runs from Harrisburg, Tex., to San Antonio, Tex., a distance of 215 m. This Co., whose offices are in Houston, Tex., was chartered in 1870, and the road opened in 1877, and has obtained from the State of Texas a land grant of 16 sections per m. *Financial statement:* Cap. stock paid in, \$4,638,794.40; represented by lands and bonds, \$1,811,205.60; total, \$6,450,000; funded debt, \$5,300,000; consisting of 1st mortgage bonds, issued 1871, \$4,300,000, payable 1910, interest 6% (Feb. and Aug.); 2d mortgage bonds, issued 1878, \$1,000,000, payable 1895, interest 7% (June and Dec.); floating debt, \$881,127.81; total cap. stock and funded and floating debts, \$12,631,127.81; per contra: cost of road, \$9,474,077.20; rolling stock, \$809,722.95; real estate, etc., \$1,702,572.29; stocks and bonds and other assets, \$1,018,328.65; total, \$13,004,701.41.

Galveston, Houston, and Henderson R.R. runs from Galveston, Tex., to Houston, Tex., a distance of 50 m. This Co., whose offices are in Galveston, was chartered in 1848. The road was opened in 1854, and in 1871 was sold under foreclosure and reorganized. *Financial statement*, 1878: Cap. stock, \$1,000,000; funded debt, \$1,500,000, 1st mortgage 7% bonds, issued 1871, payable 1902; per contra, construction and equipment, \$3,144,408.72; real estate, \$10,853.35; improvements since 1876, \$303,888.41.

Galway. See GREAT BRITAIN.

Gama Grass, a tall and esteemed fodder-grass, the *Tripsacum dactyloides*, native of Florida and Texas.

Gambir, Gambier. See CATECHU.

Gamboge [Fr. *gomme gutte;* Ger. *Gummigutt;* It. *gommagutta*], a gum-resin, the product of a tree in Siam, the name of which is doubtful. It is inodorous, and nearly insipid to the taste. The best, the pipe-gamboge, is in rolls of a dull orange-color, having a conchoidal fracture, of a deep orange yellow, and a waxy rather than resinous lustre. It also occurs in cakes, fracture uneven, slightly porous, color less bright, and lustre more resinous. The larger cakes, and such as are dark colored, should be rejected. Genuine gamboge comes from Siam, and is imported to Europe generally by the way of Singapore or China. It is used as a pigment in water-colors, and as an ingredient in some varnishes. It is also a rough and violent cathartic. *Imp.* free.

Gambroon, a kind of twilled linen cloth for linings.

Game, a collective name for wild birds and animals which are coursed or shot by sportsmen, and afford meats for the table.

Gamel, a rice measure on the east coast of Africa, of 38 lbs. weight.

Gamene, madder which has been dried and ground, without removing the outer pellicle.

Gammon, to deceive. — The salted and dried buttock of a hog, usually sold as bacon. — In Scotland, the feet of an animal.

Gammoning, a strong lashing, by which the bowsprit of a ship is secured to the cutwater.

Gandang, a bale of 25 pieces of cloth in the Philippine Islands.

Gang, a body of men employed together on any work. — A set of tools so connected that they act together, as a gang-plough, a gang of bits, etc. — A personal load, as much as can be carried at once. — A walk for cattle.

Gang-Board, a plank from a boat's side, resting on the shore, to step on.

Gang-Casks, small casks for bringing off water in boats.

Ganger, the foreman or manager of a gang of platelayers and laborers on a railway.

Ganges. See INDIA (BRITISH).

Gang-Plough, several ploughs stacked in one frame, usually supported on wheels and ridden by the operator.

Gang-Saw, an arrangement of saws placed parallel in a gate, so as to make a number of kerfs simultaneously, ripping up the log into lumber at one passage along the ways. In the large saw-mills of the lumber regions, these are known as *slabbing-gangs, stock-gangs, Yankee-gangs, live-gangs*, differing in certain particulars and purposes. — *E. H. Knight.*

Gangue, the matrix or portion of a rock in which an ore is deposited. — The superfluous earthy matter of a smelting-furnace.

Gangway, the passway or entrance into a ship by the steps on the side; a narrow passage among the cargo in the hold, to facilitate inspection, examine leaks, etc.

Gannister, a variety of sandstone, which, when ground and mixed with clay, is used for lining furnaces.

Gant, the French name for glove.

Gantang, a Malayan measure of capacity, containing 256 cubic inches. For grain, it is divided into 4 chupahs. In Malacca, the gantang of rice weighs 6½ lbs. avoirdupois; in Macassar, it is 8 lbs. 5 oz.; and in Java and Borneo it is even more.

Ganza, a small base coin in some parts of India beyond the Ganges, worth about 2 cents; also, a name in India for the dried leaves and flowers of hemp, an article of export from Bombay.

Garance, Garancine. See MADDER.

Garbage, waste animal substances; the entrails of animals.

Garbanzos, the Spanish name for the chick pea, the grain or vetch of the *Cicer arietinum;* largely used as an ingredient in the famous olla podrida.

Garbelled, a commercial term for sorted or picked; formerly restricted to spices, but now applied to any kind of sorting.

Garbling, a commercial term for picking or sorting, hence the worst or refuse of any staple is called "garblings," or "garbles."

Garce, an Indian measure of capacity for grain, oil, seeds, etc., containing 12.8 maunds, or 400 marcals, and equal to 9,256¼ lbs. The garce of Masulipatan is 156¼ bushels.

Garden, a cultivated piece of land, usually near a dwelling-house, for raising fruit, flowers, or vegetables.

Garden-Engine, a watering-machine, with a small hose attached.

Gardener, one who has the charge, and attends to the management, of a garden.

Garden-Labels, wooden, metallic, or porcelain labels for the names of plants, to be fixed in the earth.

Garden-Seat, a rustic chair, or cast-iron seat.

Garden-Tools, spades, hoes, forks, rakes, and other appliances for cultivating and keeping a garden in order.

Gargle, Gargarism, Throat-Wash, a liquid medicine applied to the back part of the mouth or upper part of the throat. Gargles are applied by allowing a small mouthful to run as much as possible over the affected part, by holding the head backwards, and breathing through it, by which means the liquid is agitated, and its action promoted.

Gari, an Indian term for 4,000 rupees, or $2,000.

Garland, a large rope or strap lashed to a spar when hoisting it on board a vessel. — A wreath of flowers.

Garlic, a perennial plant (*Allium sativum*), a native of Sicily, and cultivated for its root, which consists of pungent acrimonious bulbs, of a strong and offensive smell. It is employed as a condiment, and is an ingredient in curries; it is also used in medicine. Besides the *G.* raised in this country, large quantities, packed in cerоons, are imported from Sicily and other parts of Europe.

Garment, any article of clothing, as a coat, gown, etc.

Garner, to store up.

Garnet (from Fr. *Grenat*, of the color of pomegranate seeds) is a precious stone, of which there are different kinds. The most valuable is the *Almandine*, *precious garnet*, or *carbuncle*, a beautiful crystallized mineral, of various shades of red, with sometimes a tinge of yellow or blue, or a smoky aspect. It is commonly translucent, often transparent. Principal localities, Ceylon, Pegu, and Greenland. *Common garnet* differs from the preceding, in being commonly opaque or only translucent; color, reddish, yellowish, greenish, or blackish brown. It is found in Scotland, Sweden, and other countries. *Pyrope* is a deep blood-red variety, in roundish and angular grains, completely transparent; chief localities, Germany and Ceylon. Others are distinguished by different names; as, *pyreneite*, which is a back variety; *grossular*, of a light olive-green color; *aplome*, usually of a deep brown or orange-brown, and opaque; *manganesian garnet*, of a deep hyacinth or brownish-red; *melanite*, usually quite black and opaque; *colophonite*, of a greenish, yellowish-brown, or orange-red color; *allochroite*, of a grayish, dingy yellow, or reddish hue, and opaque; and *topazolite*, which is of a topaz-yellow. *Imp.* duty, not set, 10 per cent; set, 25 per cent. — A corn measure of Russia, the 64th part of a chetwert. — A purchase or description of tackle on the mainstay of a ship for hoisting cargo in and out.

Garnice, a measure of capacity in use in Poland, fixed legally at about 7 pints, but which varies in some parts of Russia.

Garnish, to embellish or beautify. — A Scotch law term, signifying to give notice, or warn.

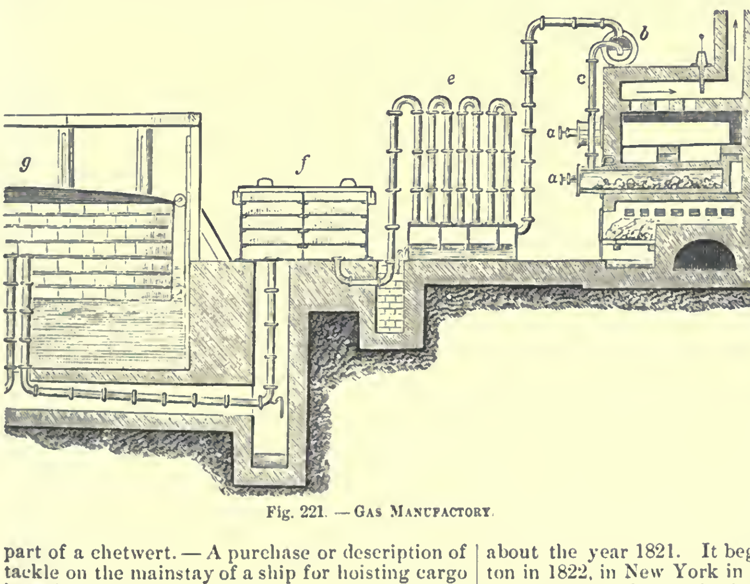


Fig. 221. — Gas Manufactory.

Garnishee, in law, a person in whose hands money or property belonging to a third person is attached; who is warned by a garnishment or notice not to pay the money, but to appear and answer to the suit of a plaintiff creditor.

Garniture, ornamental appendages or trimmings; the furniture or fittings to finish or embellish anything.

Garrafon, the Spanish name for a large stone jar in which spirits or cordials are sometimes shipped.

Garret, an uppermost room in a house, also termed an attic.

Garreting, small splinters of stone inserted into flint walls, or the joints of coarse masonry.

Garrot, in surgery, a tourniquet, consisting of a band and a stick, the former being twisted by the revolution of the latter.

Garter, a band, string, or ligament used to tie a stocking to the leg, so as to prevent it from slipping down.

Garthe, a weir or enclosure for catching fish in a river.

Gas, a permanently elastic aeriform fluid. The principal gases are the elementary bodies hydrogen, chlorine, oxygen, and nitrogen, and the compounds ammonia, carbonic acid, carbonic oxide, carburetted hydrogen, hydrochloric acid, phosphoretted hydrogen, protoxide of nitrogen, sulphuretted hydrogen, and sulphurous acid.

Coal Gas, Gas-Light, Illuminating Gas. The term *gas* is popularly applied to the mixture of inflammable elastic fluids obtained by the destructive distillation of coal or other carbonaceous substances. This gas was first evolved from coal by Dr. Clayton, in 1736–1739. — *Phil. Trans.* Its application to the purposes of illumination was first tried by Mr. Murdoch, in Cornwall, in 1792. The first display of gas-lights was made at Boulton and Watt's foundry, in Birmingham, on the occasion of the rejoicings for peace in 1802. Gas was permanently used to the exclusion of lamps and candles at the cotton mills of Phillips and Lee, Manchester, where 1,000 burners were lighted, 1805. Gas-lights were first introduced in London, at Golden Lane, August 16, 1807. They were used in lighting Pall Mall in 1809, and were general through London in 1819. From that time its use steadily increased, until now it has become general in the towns and cities of the civilized world. In the U. States attempts were made to introduce gas about the year 1821. It began to be used in Boston in 1822, in New York in 1827, and in Philadelphia in 1835. From the best foreign cannel-coal are sometimes produced as high as 15,000 cubic feet of gas per ton; but from the coals in ordinary use, 9,000 to 10,000 feet per ton is an average yield. The price of gas varies, of course, with the cost of coal and labor. It ranges from $2 to $4 per 1,000

cubic feet in the principal cities. In some of the smaller towns, where the consumption is less, the price is considerably higher.

Manuf.. The apparatus used in the manufacture of gas on the large scale consists essentially (Fig. 221) of a system of closed retorts, *a*, *a*, of cast-iron or fire-clay, generally having the form of a flattened cylinder, and arranged in sets of three or five, and heated by the same coal-fire. The quantity of coal required to charge each retort is about two bushels, and it takes about four hours for the coal to give off all its gas. When it has done this, the resulting coke is removed from the retort, and a fresh charge of coal is thrown into it, the mouth of the retort being then closed with a thick iron plate, and luted with clay. An iron pipe, *c*, ascends from the upper side of the front of the retort, projecting from the furnace, and, after describing a curve at its upper extremity, this iron pipe opens into a much wider tube, called the *hydraulic main*, *b*, which latter passes horizontally along the front of the range of furnaces, the tubes from all the retorts dipping into it. The hydraulic main is always kept half full of the water and the tar which condenses from the ascending gas; owing to which arrangement the opening into each retort is effectually closed by a water-valve, and thus permits a fresh charge of coals to be thrown in, and of coke to be withdrawn in any one or more of the retorts, without interfering with the distillation going on in the others. The aqueous portion of the liquid deposited in the hydraulic main, which is known as the *ammoniacal liquor*, and forms the principal source of the commercial salts of ammonia, passes off into cisterns, and the hot gas, after leaving the hydraulic main, passes into the *condenser*, *e*, which is composed of a series of bent iron tubes, these being kept cool either by the large surface they expose to the air, or, if necessary, by means of a stream of cold water applied to the outside. Any of the volatile hydrocarbons or salts of ammonia escaping condensation in the hydraulic main are arrested in the condensers, but not always; hence it is necessary to afterwards carry the gas through a *scrubber* (not figured in the plate) or case containing pieces of coke, over which a stream of water being made to trickle, absorbs any remaining ammoniacal vapors. The gas next passes through another series of vessels, called the *purifier*, *f*, containing quick-lime, of the consistency of cream, which cleanses the vapor of its sulphurous intermixtures. From the lime the purified vapor of the coal, or, in other words, the gas, now flows into one of the *gasometers*, *g*, or, more properly, *gas-holders*, which are the immense vertical cylinders forming such conspicuous objects at gas-works. Each gasometer is closed at the top, and floats with its open bottom in a tank of water. Some of them are telescopic in their action, to increase the internal capacity without increasing the diameter; the vast diameter of 160 feet is occasionally given to them. The substance is sheet-iron, tarred within and without, and strengthened in various ways with iron rods. Balance weights and chains enable the gasometer to float in the tank of water, and to rise in proportion as the gas accumulates in the inside. The water is to prevent any leakage of gas. The tendency of the gasometer to descend by its actual weight produces a condensing pressure on the gas within, and this pressure tends to drive the gas through miles of street pipe. The main pipes which proceed from the gas-works are large in diameter; those through the minor streets smaller; and those into the houses smaller still. The larger pipes are of cast-iron, in pieces 9 or 10 feet long, well jointed and luted. As some districts require more gas than others, as more is required in winter than in summer, as there is a large and sudden demand every day just as night closes in, and as there is always less demand on Sunday than on week-days, a vast amount of consideration is needed in storing a sufficient quantity, and in making the pressure vary with the demand by the aid of *pressure-indicators* and *self-acting governors*. The smaller pipes, to convey the gas into houses, are often of lead or pewter. — The machinery of all gas manufactories is the same in principle, and seems now to be almost perfect. The chief improvements made in the machinery consist in the manner of applying to the gasometer the pressure which regulates the force of the gas.

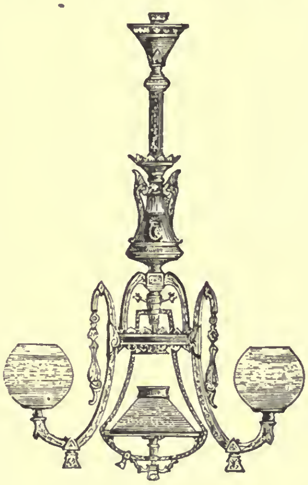


Fig. 222. — Gasalier.

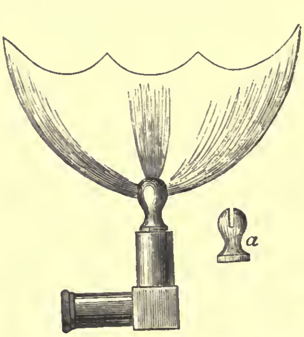


Fig. 223. — Bat's-Wing Burner.

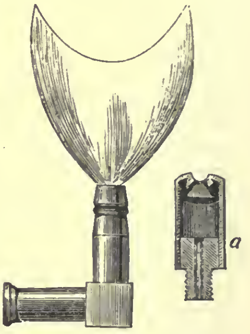


Fig. 224. — Fish-Tail Burner.

Gasalier, a chandelier with branches tipped with gas-burners.

Gasoline. See Benzole.

Gas-Bracket, a metal branch, which, proceeding from a wall, connects a burner with the gas-pipe.

Gas-Burner. This is nothing more in principle than an orifice, or a row of orifices, through which the gas escapes from the pipe, to be burned as a jet; but as the object in view is to cause every atom of gas to produce flame, much ingenuity has been displayed in so arranging the orifices as to attain this end. If contact with the external air is not sufficiently complete, some of the gas will go off in a non-luminous state, either as invisible gas or as smoke. The glass chimney, generally used around and above the flame, regulates the mode in which the air gets access to the gas; and the numerous forms given to it are indicative of the large number of experiments which have been made on the subject. Various arrangements of the orifices give rise to forms of *B.* among the best known of which are: the *bat's-wing B.* (Fig. 223), consisting of a nipple, *a*, generally of cast-iron, across which the gas escapes in a thin fan-like flame. The *fish-tail B.* (Fig. 224), which is made by two oblique orifices (*a*), so that two streams of gas impinge against each other, producing divergence, and bringing the carburetted hydrogen in contact with the air. The *cog-spur B.* has three apertures, one central and the others divergent. The *Argand B.* (Fig. 225) consists of a ring pierced with holes rounded with a glass shade to regulate the supply of air and steady the flame. The *Bude's*, *Frank-*

Fig. 225. — Argand Burner.

land's, *Leslie's*, *Winfield's*, etc., are modifications of the Argand *B.* The *sunlight*, or *Faraday's ventilating B.* consists of a ring of common burners set in the base of a reflecting cone that passes through the ceiling, and conducts away the products of combustion, and thus lights and ventilates the room at the same time. The *Union B.* consists of a row of holes so contrived that the jets touch and nearly coalesce, each, however, preserving partly its distinctiveness.

Gaselier, Gazifere, an apparatus for making aerated waters.

Gas-Engine, an engine in which gas is applied as a prime mover instead of either steam or air. In *Lenoir's gas-engine*, now much employed in France, the source of power is the expansion arising from the explosion of gas. It is, in truth, an *air*-engine, *gas*-engine, and *galvanic*-engine all in one. Air and gas are admitted to the cylinder in the preparation of 11 to 1; a spark from a galvanic battery is sent through it; the spark explodes the mixture; and the expansion consequent on this explosion drives a piston to the other end of the cylinder. Mechanism does all the rest, — opens a slide-valve to afford exit for the exploded mixture, drives the piston back by the momentum of a fly-wheel, opens tubes for the admission of new air and gas, establishes connection again with the battery, and prepares for the renewal of the action; and so on continuously. These engines are

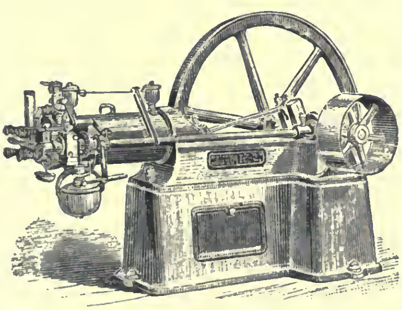


Fig. 226. — Gas-Engine.

costly in the first instance, and many precautions are necessary to prevent them from being overheated; but they require no stoker, and are rather cheaper to work than a steam-engine: consequently, they are much employed for two to four horsepower purposes. — The *Otto Silent Gas-Engine* (Fig. 226) consists mainly of a jacketed cylinder, with piston, slide-valve, and governor, having a cut-off mechanism to regulate the supply of gas according to the varying load on the engine. The pressure utilized for the production of the power is generated in the cylinder, and at once availed of therein to propel the piston. This pressure is due to the combustion of a peculiar mixture of common coal gas and air, which is ignited by a small flame, carried from a burning gas-jet outside into the cylinder by the motion of the slide.

Gas-Fitter, one who fits up the pipes, brackets, burners, etc., for gas-lighting. The term *gas-fitting* is applied to the different contrivances for the application of gas-lighting, consisting of pipes, services, meters, burners, etc.

Gas-Fitter's Tongs are tongs for holding gas-pipes while screwing joints together.

Gas-Fixtures are the ornamental fittings or appendages at the extremity of the pipes which conduct gas from the meter to the different apartments of a building, as brackets and gasaliers (Fig. 222), including stopcocks and burners. Gas-fixtures are included among the specially artistic productions of industrial skill in this country. Great taste is shown in designing and manufacturing them, and the principal houses engaged in their production are constantly vying with each other to produce new effects of style and finish.

Gas-Furnace, a small furnace now much used in laboratories. The burner is so contrived that a stream of common gas is made to give as much heat as possible, without any regard to the light produced; which is just the reverse of the object sought to be obtained in gas-lighting.

Gas-Gage, an instrument for ascertaining the pressure of gas.

Gas-Generator, a chamber, machine, or retort, in which gas is evolved.

Gas-Governor, Gas-Regulator, an apparatus employed to regulate and equalize the pressure of gas when flowing for burning.

Gas-Heater, an apparatus, of which there are many forms, in which gas is applied to the specific purposes of heating or cooking. One of these contrivances depends on the use of *asbestos*, a substance which may be brought to a white glowing heat without actually burning or consuming. A kind of grate is formed, with hollow tubes instead of iron bars; the tubes communicating end to end, and being ranged parallel, further back at the upper rows than the lower. The tubes are gas-pipes, and small perforations in them serve as jets. The gas might simply be lighted in this form, producing minute jets of flame; but this would not imitate the appearance of an ordinary open fire. The grate is therefore filled up with asbestos shavings, which soon present a dazzling mass of white-hot fire, with gas-flames darting up through all the interstices. This of course requires that the fireplace be made on purpose, and that the tubular bars should be placed in connection with the gas-pipes of the house. *Ward's Stove* has a row of gas-jets near the bottom of an iron case roomy in length and breadth, but very shallow from front to back. It is not an open fireplace, but a close stove, which heats a large surface of sheet-iron by the consumption of a small amount of gas. *Graham's Cooking-Stove* has a considerable length of gas-pipe, twisted about in horizontal coils a little below the upper horizontal plate. The coils are so placed that immediately over them the plate can be opened, and saucepans and vessels of various kinds exposed to the direct ascensive heat of the gas, issuing in numerous ignited jets from holes in the pipe coil. Some of the coils are made applicable for roasting, some for baking, some for heating water in a boiler; and the action of all the coils is governed by appropriate stopcocks.

Gas-Holder, a large reservoir for containing gas; a gasometer. See Gas.

Gaskets, on shipboard, plaited cords, or small ropes, used to secure a sail to the yard, or boom, when it is furled.

Gaskins, packings of hemp; wide open hose.

Gas-Light, a jet of flame from ignited coal-gas. See Gas.

Gas-Mains, the large iron supply-pipes by which the gas is distributed from the manufactory to different localities in a town.

Gas-Meter. In the measurement of gas, to determine how many cubic feet the company shall charge to the consumer, a *meter* is used, which is constructed in one or other of many different ways. (1.) *Wet Meter.* This consists of a kind of

drum, divided into compartments, all of equal and known capacity. The drum revolves in water, in which it is rather more than half immersed. There are numerous modes of arranging the different parts of the apparatus; but the general action is this,— all the gas from the street-mains to the house pipes pass through the meter; every cubic foot so passing gives a certain portion of one revolution to the drum on its axis; and this revolution, through a train of wheels, acts upon index-hands, which tell of 1,000, 10,000, 100,000, 1,000,000, etc., cubic feet of gas. (2.) *Dry Meter.* Sometimes it is found that the water in the wet meter freezes in cold weather, and that some of the gas passes through without being registered. To obviate these defects, many of the companies prefer *dry* meters. In these the gas is measured by the number of times that a certain quantity will fill a chamber capable of undergoing contraction and expansion by the passage of the gas. For this purpose the partitions in the meter are made of flexible leather instead of inflexible metal. The undulations of the leather affect certain arms and levers, which in their turn give motion to wheels and index-hands. The flexible leather being the characteristic of this class of meter, as water is of the other class, the particular modes of developing the action are very numerous. To suit the requirements of different establishments, meters are supplied of various sizes, known by the number of lights which the gas is fitted to supply, — such as 2-*light*, 10-*light* 50-*light* meter, and so on. A definite arrangement is made between the company and the consumer in regard to the meter; and care is taken that the interior of the meter shall be so placed under lock and key as not to be tampered with.

Gasometer. See GAS.

Gasoscope, an apparatus for indicating the presence of bicarburetted hydrogen gas in buildings, mines, etc.

Gaspereaux, a name for the alewife.

Gas-Pipe. See GAS.

Gas-Register, an instrument by which the pressure of gas is indicated and recorded.

Gas-Regulator. See GAS-GOVERNOR.

Gass, a money of account in Persia, the twentieth part of a mamoodi, and worth rather more than half a cent.

Gassing, the process of singeing net, lace, etc., in order to remove the hairy filaments from the cotton. It is performed by passing the material between two rollers, and exposing it to the action of a large number of minute jets of gas.

Gas-Socket, the metallic socket which slips over the tip of a burner, and connects the elastic gas-tubing therewith. — *E. H. Knight.*

Gas-Stove, see GAS-HEATER.

Gas-Tar, the bituminous and very complex substance which distils over in the manufacture of coal-gas. From it are now obtained benzol, toluol, phenol, naphthalene, and anthracene, which give us the brilliant aniline colors.

Gas-Works, the plant and general buildings belonging to a gas-company.

Gate, a doorway or entrance, of which there are various kinds. The term is now chiefly applied to any light, swinging wooden or metal construction, as a wicket-gate, garden-gate, turnpike-gate, etc. In founding, the gutter or hole through which the molten metal is poured; also a founder's name for a ridge in a casting, which has to be sawn off.

Gate-Hinge, a long strong hinge for suspending a gate by.

Gate-Way, an entrance to some enclosed place.

Gattie, the name of an East Indian soluble gum, obtained from the common babool, or *Acacia Arabica;* it is very similar to the African gum arabic.

Gaub, an Indian name for the fruit of *Diospyros embryopteris*, which, when expressed, exudes an excessively astringent juice, yielding 60 per cent of pure tannic acid. It is used in medicine as an astringent and styptic, and is employed in Bengal for paying the bottom of boats.

Gaucho, a mounted herdsman in Patagonia and Buenos-Ayres.

Gauffering, is a manner of plaiting or crimping where the flutes are unusually wide.

Gauge, Gauging. The term *gauge*, or *gage*, is used in different ways, but always with reference to measure or proportion; or, in the literal sense of the word, to that which bounds or confines something else. Thus, in physics, it is applied to several instruments or apparatus for measuring the state of a phenomenon; such as the wind-gauge, rain-gauge, the barometer-gauge for measuring the degree of pressure of the air within the receiver of an air-pump, etc.; in architecture, to the length of a slate below the lap; in railway-engineering, to the space between the rails, and the like. *Gauging* is the art of measuring dimensions, direction, and intensities of different kinds.

The maintenance of uniform or standard dimensions in machine fitting is fast becoming a rule and almost a necessity, enhancing the value of what is made, and at the same time cheapening the cost of production by permitting a more extended division of labor. The division of labor in machine fitting depends on what may be called duplication, that is, producing one thing like another, so that different workmen may, independent of each other, prepare parts or pieces which can be assembled and put together without trying and hand fitting. The export of American-made machines to Europe commenced, it may be said, because of an early and successful application of the gauging system. One of the first and most important orders received from Europe for machinery was for a nearly complete equipment of implements for the Enfield small-arms factory, in England; machines and tools the main object of which was a duplication of their product. Watches, clocks, sewing-machines, small arms, with many other articles of a similar kind, are now made in this country and sold in Europe, because the system of gauging and duplicating offers an advantage overbalancing cheaper labor, cheaper material, and more than 3,000 miles of ocean carriage. Most of our larger establishments have been supplied with standard gauges imported from England, and corresponding to what is called the Whitworth standard. Most of these gauges are made in the works of the Whitworth Company at Manchester, who by long experience and their reputation for good work have controlled this manufacture. Of late years, however, some fine examples have been made in this country, but at prices much greater than are demanded for English gauges. The British and American standards for lineal measure are the same. The British standard is an arbitrary one, fixed after several years of labor on the part of a learned commission and at considerable expense. The pendulum test, which was the only natural one by which experiments were made, was abandoned after thousands of readings showed its inconstancy. The French mètre of the forty-millionth part of the earth's meridian, as well as all other natural standards, were abandoned for the same reason, and the wisdom of this course has been proved by the French government since adopting an arbitrary standard the same as the English had done. In this country, while there has been more spent in preparing comparative standards than by any other government in the world, there has been no search, so far as we know, after natural or other standards. The equipment of implements of transmission and for measuring exceeds that of which any other country can boast, but the principal wisdom shown in the matter has been in avoiding the useless expense of fixing an independent standard which might be anything. By comparison, under similar conditions, a metal test-rod adjusted at Washington, and a similar one adjusted at London, would show a difference due to ten degrees of temperature, and this is no doubt the only difference. It is enough to know that gauges made to a carefully adjusted standard here will match and interchange with those made in England. The term *gauging* is commercially applied to the method of determining by actual measurement the number of gallons contained in vessels intended to hold goods, — chiefly casks, barrels, vats, etc. The principal use of gauging is in the collection of the

revenue, in which it is necessary to measure the bulk of vessels, without disturbing their contents. The principles of gauging are those which are furnished in geometry for the measurement of solids. As, however, the men who are engaged either in commerce or by the excise for the purpose of gauging are not likely, in general, to be acquainted with the principles upon which the art depends, a set of technical rules and appropriate instruments have been contrived, by which the art can be practised by any one of moderate intelligence. The instrument usually employed is the gauging rod, or diagonal rod, by which the contents of a cask are inferred from its diagonal length, measured from the bung-hole to the extremity of the opposite stave at the head. A scale of inches, for taking the measure of the diagonal, is described on one face of a square rule, usually about four feet long, and on the opposite face is a scale expressing the corresponding contents of the cask in gallons. Although this method, obviously, can only give approximate results, yet by using larger sliding-rules for calculation, and the aid of habit, derived from experience, it is possible to attain considerable accuracy in measuring the contents of casks, which do not depart from a given standard of form. The rates for gauging in New York are generally 12 cents for a cask; 4½ cents for cases and baskets; and 1½ cents for a dozen bottles of porter, ale, and beer.

Gauger, an excise-officer, a measurer of the contents of casks, etc.

Gauntlet, a long glove which covers the wrist.

Gauze, a very light and transparent textile fabric, woven of thread and silk, and sometimes of thread only; it is made either plain or figured. The best comes from France and Switzerland.

In the ordinary processes of the loom, the warp threads are always kept parallel, in whatever way the weft threads may be twisted around them. But in making *gauze* two adjoining warp threads are completely twisted round each other between two throws of the shuttle or casts of the weft. Some peculiar appendages to the loom are required to effect this. One consequence of the mode of interlacing is, that the texture is light, the weft threads being further apart than would be practicable in other webs. In appearance, as well as in mode of producing, gauze occupies a kind of medium position between plain weaving and plain lace or bobbinet.

Gauze Ribbon, a thin kind of ribbon made of gauze.

Gauze Wire-Cloth. See WIRE-CLOTH.

Gavel, a loose-lying heap of wheat, rye, or other grain; enough to be bound in a sheaf.

Gayal, a name in some parts of India for the *Agave vivipara*, a cordage plant.

Gaze-à-blutoir, a very thin kind of silk gauze, used by millers in France for bolting-cloths, which has been made as fine as 220 threads to the inch.

Gazlich, a cotton fabric made in Turkey.

Gazzies, mixed caravans in Africa, on a smaller scale than kafilahs, and comprising camels, mules, asses, and men and women.

Gea, a name in some of the Pacific islands for the breadfruit.

Gear, accoutrements; apparatus; harness. A general term for the several working parts of a locomotive, or of any machinery. See GEARING.

Gearing, a term applied to the parts of machinery by which motion in one part of a machine is communicated to another. *G.* consists in general of toothed wheels, friction wheels, endless bands, screws, etc., or of a combination of these. When the communication between the two parts of the machine is interrupted, the machine is said to be *out of gear*; and when the communication is restored, it is said to be *in gear*. *G.* which can be put in and out of gear is called *movable G.*; that which cannot, as, for instance, the wheelwork of a watch, is called *fixed G.* *Straight G.* is used when the planes of motion are parallel to each other; *bevelled G.* when the direction of the plane of motion is changed. *G.* has also for its object the increasing or diminishing of the original velocity, and in reference to this is distinguished by the term "multiplying" or "retarding."

Gebräude, a name in Germany for the quantity of beer brewed at one time; in Berlin it is a liquid measure of about 106⅔ gallons.

Ged, a Scotch name for the pike fish.

Geira, a land measure of Portugal, about 7,000 sq. yards.

Gelatine [Fr. *gélatine*; Ger. *Gallert*, *Leim*] is animal jelly, obtained by the prolonged action of boiling water on the organic tissue of the bones, tendons, and ligaments, the cellular tissue, the skin, and the serous membranes. Glue and size are coarse varieties of *G.*, prepared from hoofs, hides, skins, etc.; and isinglass is a purer kind, obtained from the air-bladders or some other membranes of fish. *G.* is insoluble in cold water, but dissolves with greater or less readiness on the application of heat, according to the source where it is obtained, and in this state forms a tremulous and transparent jelly on cooling; it is insoluble in both alcohol and ether, and is decomposed by the strong alkalies and acids. Alcohol and tannic acid precipitate *G.* from its solution; the former by abstracting the water, the latter by combining with the substance itself into an insoluble compound, of the nature of leather. No other acid except the tannic, and no alkali, possesses the property of precipitating *G.* But chlorine and certain salts render its solution more or less turbid; as the nitrate and bichloride of mercury, the protochloride of tin, and a few others. Sulphuric acid converts a solution of *G.* at a boiling heat into sugar. *G.* is largely employed as an article of food, as in soups, jellies, etc.; but its value in this respect has been, perhaps, overrated. Animals fed exclusively on *G.* die of starvation. But when mixed with other food, especially with substances abounding in albumen, casein, or fibrin, *G.* may be useful as an aliment, and serve directly to nourish the gelatinous tissues. The *G.* is also used as a material in the dressing of stuff goods, as a refining ingredient in the clarification of wine, as a chemical test for tannin, in photography, in the manuf. of cements, in confectionery, for artificial flowers, in pharmacy for coating pills and making capsules, etc. *G.* is imported chiefly from France, in thin sheets of semi-horny texture, without taste or smell, colorless and transparent, and varying in toughness according to the tissues from which it is prepared. It is also extensively manufactured in New York. One reason why the French have made so much advance in the manuf. of *G.* is, that there are in that country well-arranged and systematic establishments for the slaughtering of cattle, sheep, swine, and horses; affording great facilities for the economical application of the hides, skins, bones, tendons, ligaments, and other gelatinous tissues. They excel in producing different kinds of *G.* in thin sheets; pure and white films cut into threads for the use of the confectioner; very thin, white, and transparent sheets, called "papier glacé," or ice-paper, for copying drawings; dyed, gilt, and silvered gelatine sheets, adapted to the fabrication of artificial flowers and to the production of an almost endless variety of ornamented articles; and sheets embossed or stamped with elegant patterns. *Imp.* duty, 35 per cent.

Gelatine Process. See PHOTOGRAPHY.

Gelding, a castrated horse.

Gelso [It.], the mulberry-tree.

Gemel-Hinge, in locksmithing, a hinge consisting of a loop and a hook.

Gems. See PRECIOUS STONES.

Gen, a kind of manna obtained in Persia, Arabia, and other Eastern countries, from the camel's thorn, *Hedysarum alhagi* of Linn. It is collected from the branches by the Arabs and caravans which cross the desert, and is used as food.

Genappe, a worsted yarn or cord used in the

manufacture of braids, fringes, etc.; its smoothness enabling it to be well combined with silk.

General Average. See AVERAGE.

General Order Store, a government bonded warehouse to which, under a "General Order," all foreign merchandise is sent that is not claimed by the owner or consignee within a certain number of hours or days after the arrival of a vessel in port; the owner and the goods are answerable for the expenses of cartage, storage, etc. — *T. McElrath.*

Generator, a vessel for generating steam from water (see BOILER). — An apparatus for generating carbonic acid for charging bottles, etc., with soda and mineral waters (see SODA-WATERS). — A retort in which coal-gas is generated (see GAS).

Geneva. See HOLLANDS.

Geneva, Ithaca, and Sayre R.R. runs from Geneva, N. Y., to Sayre, Pa., a distance of 75.63 m. This Co., whose offices are in Philadelphia, Pa., was organized by the consolidation of the Geneva and Ithaca R.R., and the Ithaca and Athens R.R. In 1875 it was placed in the hands of a receiver, its interest having defaulted, and was subsequently bought in the interest of the Lehigh Valley R.R. Co. *Financial statement:* Cap. stock, paid in, \$850,000; funded debt, \$600,000 7% bonds, issued 1870, interest Jan. and July; floating debt, \$192,248.06; total stock, bonds, and debt, \$1,642,248.86. Per contra: cost of construction and equipment, \$1,481,297.06.

Genevrette, a wine made of juniper-berries.

Genoa. See ITALY.

Gentian [Fr. *gentiane;* Ger. *Enzian;* It. *genziana;* Sp. *jenciana*], the roots of two alpine plants, *Gentiana lutea* and *Gentiana purpurea*, found growing in Switzerland and Austria, the Apennines, the Pyrenees, and in North America. Those brought to this country come from Germany. They are in pieces of various lengths and thickness, twisted and wrinkled on the outside, and covered with a brownish-gray cuticle They have no particular odor, and the taste is intensely bitter, without being nauseous. It was formerly a favorite remedy in agues.

Gentianin, a substance obtained from the root of common gentian. It forms golden-yellow needles, scarcely soluble in cold water, but very soluble in alcohol and ether. It is a powerful bitter and stomachic.

Gentionella Blankets, a heavy, closely woven woollen fabric, used for coatings and wrappers, and somewhat resembling pilot-cloth.

Geometric Pen, an ingenious instrument for drawing geometric curves, in which the movements of a pen or pencil attached to a revolving arm of adjustable length are varied by changing the toothed wheels which give motion to the arm. — *Webster.*

Georgetown, a city and port of entry of the U. States, in the District of Columbia, at the head of the Potomac River navigation, about 125 m. from the sea, and 2 m. W. N. W. of Washington. Large quantities of flour are barrelled there, and the coastwise trade is considerable. *G.* possesses 99 vessels, having an aggregate tonnage of 8,760. In 1878, 232 vessels (tonnage 96,329) entered, and 91 vessels (tonnage 43,624) cleared the port. Pop. 13,000.

There is another port of entry of this name in South Carolina, for which see SOUTH CAROLINA

Georgia, a southern State of the U. States, lying between lat. 30° 22′ and 35° N., lon. 81° and 85° 30′ W. It is bounded N. by Tennessee and N. Carolina, N. E. and E. by S. Carolina and the Atlantic, S. by Florida, and W. by Alabama. Extreme length from N. to S. 320 m., breadth 254 m. Area, 58,000 sq. m. Pop about 1,300,000. The coast line of *G.* extends about 100 m., and is skirted by a series of low, flat, sandy islands, leaving but four navigable entrances without, — at Savannah, Darien, Brunswick, and St. Mary's. The mainland for about 50 m. into the interior is perfectly level, and for several miles from the seaboard consists of a salt marsh of recent alluvium; the whole of the flat country is intersected by swamps, which are estimated to constitute one tenth of the whole State. At the extremity of the low country there is a barren sandy tract of rather greater elevation, which extends N. as far as the river falls, and is generally regarded as dividing the upper from the lower country. Farther N. the surface becomes gradually more hilly and broken, and the N. extremity of the State comprises some of the most southern ridges of the Appalachian mountain chain, which here rise to about 1,500 feet above sea level. The rivers are the Savannah, 600 m. long, bounding the State on the N. E., navigable for ships 17 m. to Savannah, and a part of the year for steamboats 250 m. to Augusta, the Altamaha, which is navigable for large vessels 12 m. to Darien, is formed by the junction of the Oconee and the Ocmulgee, and is navigable for sloops of 30 tons by the former to Darien, 300 m. from the ocean; the Ogeechee, 200 m. long, and navigable for sloops 40 m.; Flint River, which rises in the N. W. part of the State, and, after a course of more than 200 m., joins the Chattahoochee, forming the Appalachicola; the Chattahoochee, on the W. border of the State, which is navigable 300 m. by steamboat to Columbus; and the St. Mary's River, in the S. W. part of the State. The soil of *G.* is, for the most part, highly productive. In the low country and the sea-islands it consists of a light-gray sand, gradually becoming darker and more gravelly toward the interior. Farther N. it is a black loam mixed with red earth, called the *mulatto soil;* this is succeeded in the more remote districts by a rich black mould of superior fertility. The mineralogical resources of *G.* are, as yet, but only partially developed. Gold has been found in considerable quantities in the N. districts, and in 1879 there were over 400 stamps in operation in the 40 gold mills in the State. Considerable investments of capital were made of late in the gold-mining region, especially in the neighborhood of Dahlonega. The yield of gold was fairly profitable in 1878, and greater results are anticipated. The portion N. E. of the State, which embraces the main developments in gold-mining, and the most striking characteristics of mountain, valley, and waterfall in *G.*, lies within Cherokee, Forsyth, Hall, Dawson, Lumpkin, White, and Habersham Counties, a belt about 100 m. long and 30 m. wide, N. of and immediately along the Atlanta and Charlotte Air-Line R.R. This region was the favorite part of the Cherokees' reservation, and to the eye it seems that no region on the globe can surpass it in extent and variety of beautiful views. The vision can here frequently sweep unbroken for more than a hundred miles over the most noble landscapes. — *Climate.* The N. parts of *G.* are

Fig. 227. — SEAL OF GEORGIA

very healthy, and the winters mild; frost and snow frequently occur, but are not severe or of long continuance. Hurricanes and thunder-storms frequently occur in the fall, at which season the agriculturists and planters generally remove either to the islands, or the most N. districts of the State. In the low region the thermometer usually ranges during the summer from 76° to 90° F., but it has been known to stand as high as 102° F. — *Forests.* The tops of the hills are mostly crowned with forests, composed chiefly of the pine, palmetto, oak, ash, cypress, hickory, black-walnut, mulberry, and cedar trees. The growth along the riparian bottoms is of canes, cypress, magnolia, gum-woods of different species, including the liquid-amber tree, oaks, tulip, sweet bay, and many other genera; while upon the sandy lands pines and scrub-oaks form almost the sole arborescence. — *Agricultural Products.* The principal are cotton, wheat, and other European grains, maize, tobacco, the sugar-cane, indigo, rice, etc. The coast islands yield large quantities of the fine description of long-staple cotton known as *sea-island.* The proportion of productive land is much greater in the hilly country than in the plains. In 1878 the returns of wild land in the State showed 7,582,323 acres, valued at 22 cents per acre. — *Commerce and Industry.* Cotton is the great commercial staple; and it and tobacco, indigo, canes, timber, deer-skins, and maize form the leading articles of export; the sugar-cane has hitherto been cultivated mostly for home consumption only. Besides the exports from Savannah (see below), great quantities of produce find their way annually to Charleston, S. C., for shipment, and also coastwise to the more N. ports. The imports consist chiefly of textile and other manufactured goods, E. India produce, wines from the S. of Europe, and butter, cheese, fish, etc., from the N. States of the Union. The manufacturing interests of *G.* lie principally in the fabrication of cotton and woollen stuffs, and the smelting, founding, and working of iron. There are in operation about 20 mills containing 70,000 spindles, which spin annually about 11,000,000 lbs. of raw cotton.

The material condition of the State for 1878, as compared with the previous year, was as follows: —

Description of Property.	Value in 1877.	Value in 1878.
Improved land	$87,182,996	$84,608,700
Wild land	1,700,518	1,656,773
City and town property	51,269,736	48,370,413
Building and loan associations	244,353	231,198
Bank shares	5,467,497	4,931,797
Money and solvent debts	27,156,216	26,130,351
Merchandise	11,424,590	11,168,425
Capital invested in shipping	133,848	612,048
Stocks and bonds	5 550,272	4,997,984
Cotton manufactories	2,739 500	2,772,673
Iron-works, etc	263,366	236,330
Capital invested in mining	72,516	71 306
Household and kitchen furniture	9,959,093	9,463,475
Watches, jewelry, etc	1,089,323	1,057,920
Horses, mules, etc	22,736,491	21,421,810
Plantation, and mechanical tools	2,943,124	2,858,338
Corn, cotton, held for sale April 1st	673,910	792,200
Other property	4,191,443	4,163,586
Defaulters' property single	861 638	670,351
Aggregate value	$235,659,530	$226,221,718

On Jan. 1, 1879, there were in *G.* 12 national banks, whose aggregate capital was $2,041,000; and 67 state banks, savings-banks, and private bankers, with an aggregate capital of $4,317,817. No State in the Union is more solvent, and should have a stronger financial reputation than *G.* On Jan. 1st, 1879, the debt of the State was only $10,444,500, a small part of which is yearly liquidated.

Atlanta, the capital of *G.* (pop. 40,000) and the terminus of all the railroads of the State, is a fine city and a place of considerable commercial importance. Its favorable position and its spirit of enterprise mark it as the future metropolis of the S. E. States. The other cities and towns of importance are Savannah, Augusta, Milledgeville, Macon, Columbus, Rome, Athens, Brunswick, and St. Mary's.

The following table, reprinted from the valuable *Manual of the Railroads of the U. States for the year* 1879, by H. V. Poor, gives the mileage, cost, earnings, and dividends of the railroads of the State in 1878; their total length on Jan. 1, 1879, being 2,414.92 miles: —

Name of Company.	Railroad.		Cost of railroad, etc., per mile.	Length of railroad worked.	Revenue per Mile.			Dividends paid in 1868.
	Total miles.	Miles in Ga.	Dollars.	Miles.	Earnings Dollars	Expenses. Per ct.	Profits. Dollars.	Per cent.
1. Alabama Great Southern	290.00	26.00	35,000	296.00	....	....	....	......
2. Atlanta and Charlotte Air-Line	269.00	104.80	23.948	269.00	2,339	68 83	729	......
3. Atlanta and West Point	80.74	80.74	14,784	87 24	3,681	61.91	1,301	8
4. Atlantic and Gulf	350.18	326.18	22,468	350 18	2,739	63 20	1,008	......
5. Augusta and Savannah (C. of Ga., 7)	53 00	53.00	19,494	....	1,455	....	1,455	7
6. Brunswick and Albany	172 00	172 00	23.000	172.00	894	86 62	119	... ..
7. Central of Georgia	311.50	311.50	25,040	713.50	3.751	59.09	1,535	5
8. Cherokee (3 and 5 feet)	23.00	23 00	24,908	23 00	1,065	82 21	189	.....
9. Eastern Tennessee, Virginia, and Georgia	272.00	15 50	33.771	272.00	3,758	59 93	1,506	3
10. Eatonton Branch (C. of Ga., 7)	22.00	22 00	11.366	....	637	....	637	8
11. Elberton Air-Line (3 feet)	50 00	50.00	4.425	... .	....	....	....	......
12. Georgia	231.00	231.00	18,004	231.00	4,388	71 79	1.238	7
13. Georgia Southern (S. R and D. Ala.)	65.70	65.70	3.118	....	218	....	218	7
14. Macon and Augusta (Ga., 12)	78.00	78.00	35,148	78 00	1,279	104 80	... ...	.....
15. Macon and Brunswick	197.00	197 00	12,462	197.00	1,678	92.49	126	.....
16. Marietta and North Georgia (3 feet)	23 00	23.00	4,622	....	....	....	....	......
17. Memphis Branch (3 feet)	5 00	5 00	....	5 00	....	....	....	... ..
18. Northeastern	40 00	40 00	13,089	40 00	1,217	54 42	554	.....
19. North and South Georgia	23.00	23 00	....	23 00	....	....	....	......
20. Oemulgee and Horse Creek	7 00	7.00	....	7 00	....	... ...	....	......
21. Rome	20.00	20.00	13,104	20 00	2,088	68 26	663	6
22. Sandersville and Tennille (Ga , 12)	3.25	3 25	....	3 25	....	....	....	......
23. Savannah and Charleston	106.00	15.50	21,392	111 25	2,723	99 34	180	......
24. Savannah, Griffin, & North Ala (C. of Ga , 7)	63 00	63.00	24,697	63 00	833	60 51	329	.....
25. Savannah, Skiddaway, and Seaboard	10.75	10.75	10.325	10 75	3,332	74 57	717	... ..
26. Southwestern (C of Ga , 7)	310.50	310.50	13,826	310 50	2,381	59 39	967	7
27. Upson County (C. of Ga., 7)	16.50	16.50	7,273	16 50	571	86 42	493	......
28. Western and Atlantic	138 00	121.00	60,145	138.00	7,912	56.99	3,390	3.75

G. has the three following ports of entry: —

Brunswick, in lat. 31° 10′ N., lon. 81° 35′ W., 80 m. S. S. W. of Savannah. It has a spacious and commodious harbor, having 13 feet of water on the bar at the lowest tides. It is situated on Turtle River, 14 m. above the bar. Its commerce has considerably increased of late, and has a direct trade with Europe. 30 vessels, with an aggregate tonnage of 3,369, belong to this port. In 1878, 383 vessels (tonnage, 139,330) entered, and 310 vessels (tonnage, 154,304) cleared, the port. The value of foreign imports in 1878 was $1,046, and of exports, $999,105. Pop. 4,000.

Saint Mary's, in Camden Co., on St. Mary's River, about 9 m. from its mouth. Its commerce and pop. are small.

Savannah, in lat. 39° 4′ 56″ N., lon. 81° 8′ 18″ W., is a fine city on the right bank of the Savannah River, 17 m. from its mouth. The harbor is good. Vessels drawing 14 feet water come up to the city, and larger vessels anchor at Five Fathom Hole, four miles below the city. The commerce of the place ranks next to Mobile, and is the most important port, except Charleston, from Baltimore to Mobile. The greater part of the trade of *G.* centres at Savannah, the principal articles of which are cotton, rice, and lumber. The Savannah River affords great facilities for internal commerce; and this river is connected with the Ogeechee River by a canal 16 miles long, which terminates at Savannah. In 1878, 682 vessels (tonnage, 593,183) entered, and 663 vessels (tonnage, 576,231) cleared the port. 67 vessels, with an aggregate tonnage of 15,972, belong to the port of Savannah. The total value of foreign exports for the year 1878 was $18,544,963; and of imports, $502,721. Pop. about 25,000.

Georgia R.R. (and Banking Co.). This road runs from Augusta to Atlanta, Ga., 171 m., with branches from Camak to Washington, 4 m.; from Union Point to Athens, 39 m.; and from Barnet to Washington, 17 m.; total, 231 m. The Co., whose offices are in Augusta, Ga., was chartered in 1833, and the road completed in 1845. The Co. owns, jointly with the Central R.R. of Georgia, the Western R.R. of Alabama, also one fifth of the Port Royal & Augusta R.R., and entirely the Macon & Augusta R.R., making a total of 413 m. owned entirely or in part by this Co. *Financial statement,* March 31, 1879: Cap. stock, $4,200,000; 6 % bonds, $1,000,000; 7 % bonds, $483,000; other liabilities, $596,597.11; total liabilities, $6,279,-597.11. Per contra: construction of road and outfit, $4,200,000; purchase account, Western R.R. of Ala., $817,973.76; one fifth interest in P. R. & A. R. R., $200,000; stocks, bonds, real estate, cash, etc., $1,572,946.64; total assets, $6,790,920.40.

Fig. 228. — Geranium.

Gerah, an Indian cloth measure, equal to 2¼ inches.

Geranium, the crane's-bill, an extensive genus of handsome flowers, in which a large trade is carried on by nurserymen. The *G. maculatum,* with flowers of considerable beauty, is the most valuable medicinal plant of the genus. An essential oil, used in perfumery, is obtained from *G. platypetalum* (Fig. 228), and some other species; but it is much inferior to the essential oil of the same name, also called *Turkish essence,* and *oil of Ginger-grass,* which is employed by the Turks to adulterate the oil of roses, and is obtained from a plant of the genus *Andropogon.*

Gérant [Fr.], the responsible manager of a joint-stock association, or newspaper establishment; the acting partner.

Gerle, a wine measure of Switzerland, about 16 gallons.

Gerloantico, a fine, rare, and rich flesh-colored Italian marble, used for statuary purposes.

German, a fire-insurance Co., located in Baltimore, Md., organized in 1865. *Statement,* Jan. 1, 1879: Cap. stock paid up in cash, $500,000; net surplus, $160,756.74; risks in force, $29,142,000; premiums, $142,671.58; premiums received since the organization of the Co., $1,306,783; losses paid, $395,225; cash dividends paid to stockholders, $243,000.

German-American, a fire-insurance Co., located in New York City, organized in 1872. *Statement,* Jan. 1, 1879: Cap. stock paid up in cash, $1,000,000; net surplus, $815,048.54; risks in force, $118,670,207; premiums, $1,081,704.07; premiums received since the organization of the Co., $6,472,805.97; losses paid, $2,669,126.17; cash dividends paid to stockholders, $740,000.

German-Clock, a small, cheap hanging-clock, largely made in Germany.

Germania, a fire-insurance Co., located in New York city, organized in 1859. *Statement,* Jan. 1, 1879: Cap. stock paid up in cash, $500,000; net surplus, $754,423.72; risks in force, $73,333,025; premiums, $727,867.06; premiums received since the organization of the Co., $10,783,104.02; losses paid, $5,019,930.72; cash dividends paid to stockholders, $1,046,000.

German-Paste, a food sold for certain kinds of caged birds, as blackbirds, thrushes, larks, etc., made of pea-meal, hemp-seed, maw-seed, lard, and honey or treacle.

German-Sausage, a polony; a bladder or cleaned gut stuffed with meat partly cooked.

German-Silver, Albata, Argentan, Electrum, Nickel-Silver, Tutenag, Virginian Plate, White Copper, a well-known alloy, the finer varieties of which nearly equal silver in whiteness and susceptibility of receiving a high polish, whilst they surpass it in hardness and durability. The manufacture of nickel or German silver has acquired great importance in this country, and has almost superseded silver-plate. The graceful patterns which it is often made to assume in the hands of the accomplished artist cannot fail to attract the admiration of the beholders in the best stores of our large cities. The following formulæ are from the highest authorities, or are the results of actual analysis of the finest commercial samples: —

1. Copper, 50 parts; nickel, 20 parts; zinc, 30 parts. Very malleable, and takes a high polish. — 2. Copper, 50 parts; nickel, 26 parts; zinc, 24 parts. Closely resembles silver; an excellent sample. — 3 Copper and zinc, of each 41 parts; nickel, 18 parts Rather brittle. — 4. (M. Gersdorff.) Copper, 50 parts; nickel and zinc, of each 25 parts. Very white and malleable, and takes a high polish. Recommended as a gen-

eral substitute for silver. — 5. (Gersdorff.) Copper, 60 parts; nickel and zinc, of each 20 parts. For castings, as bells, candlesticks, etc. — 6. (Gersdorff.) Copper, 60 parts; nickel, 25 parts; zinc, 20 parts. For rolling and wire. Very tough and malleable. — 7. (Sample made from the ore of Hilburghausen.) Copper, 40½ parts; nickel, 31½ parts; iron, 2½ parts; zinc, 25½ parts. Equal to the best Chinese sample. — 8. (Pelouze.) Copper and nickel, equal parts. Recommended by M. Pelouze as superior to any of the alloys containing zinc. — 9. (Pelouze.) Copper, 2 parts; nickel, 1 part. Not so white as the last, but more malleable. — 10. (White copper from China.) Copper, 41 parts; nickel, 32 parts; iron, 2½ parts; zinc, 24½ parts. Silvery white, takes a high polish, very sonorous, malleable both cold and at a dull-red heat, and may be rolled into leaves or formed into wire. — 11. (White metal spoon, sold as "German plate.") Copper, 55 parts; nickel, 24 parts; zinc, 16 parts; tin, 3 parts; iron, 2 parts. — The union of the metals in the above formulæ is effected by heat, with the usual precautions. When iron is ordered, it is generally added under the form of "tin plate."

Imp. duty: Unmanufactured, 35 per cent; manufactures of, 40 per cent.

German-Steel, a metal made of pig or white-plate iron in forges where charcoal is used for fuel. The ore from which it is obtained is bog-iron or the sparry carbonate.

German-Text, a name for an ornamental printing-type.

German-Tinder. See AGARIC.

Germany, a large and powerful empire of Central Europe, lying between lat. 47° 18′ and 55° 20′ N., lon. 5° 50′ and 22° 50′ E. It is bounded N. by Denmark and the Baltic; E. by Russia and Austria; S. by Austria and Switzerland; and W. by France, Luxemburg, Belgium, Holland, and the North Sea, or German Ocean. The Constitution of the Empire bears date April 16, 1871. By its terms, all the states of *G.* "form an eternal union for the protection of the realm and the care of the welfare of the German people" (*schliessen einen ewigen Bund zum Schutze des Bundesgebiets, und zur Pflege der Wohlfahrt des deutschen Volkes*). The supreme direction of the military and political affairs of the Empire is vested in the king of Prussia, who, as such, bears the title of Deutscher Kaiser. According to Art. 11 of the constitution, the Kaiser represents the Empire internationally (*hat das Reich völkerrechtlich zu vertreten*), and can declare war, if defensive, and make peace, as well as enter into treaties with other nations, and appoint and receive ambassadors. To declare war, if not merely defensive, the Kaiser must have the consent of the Bundesrath, or Federal Council, in which body, together with the Reichstag, or Diet of the Realm, are vested the legislative functions of the Empire. The Bundesrath represents the individual states of *G.*, and the Reichstag the German nation. The members of the Bundesrath, 59 in number, are appointed by the governments of the individual states for each session, while the members of the Reichstag, 397 in number, are elected by universal suffrage and ballot, for the term of three years. Both the Bundesrath and the Reichstag meet in annual session, convoked by the Kaiser. The Kaiser has the right to prorogue and dissolve the Reichstag, but the prorogation must not exceed sixty days; while in case of dissolution new elections have to take place within sixty days, and a new session has to open within ninety days. All laws for the Empire must receive the votes of an absolute majority of the Bundesrath and the Reichstag. The Bundesrath is presided over by the Reichskanzler, or Chancellor of the Empire, and the President of the Reichstag is elected by the deputies. The laws of the Empire, passed by the Bundesrath and the Reichstag, to take effect must receive the assent of the Kaiser, and be countersigned when promulgated by the Chancellor of the Empire. The latter, in his capacity as President of the Bundesrath, has the right to be present at the deliberations of the Reichstag. — Berlin (for which see PRUSSIA) is the capital of the Empire.

The following table gives the area and population of the 25 states of *G.* in the order of their areas, and of the Reichsland of Alsace-Lorraine, together with the average density of pop. of each, as returned by the census taken Dec. 1, 1875.

STATES OF THE EMPIRE.	Area in sq. miles.	Population, Dec. 1, 1875.	Density of population per sq. m.
1. Prussia	137,066	25.742,404	188
2. Bavaria	29,292	5,022.390	170
3. Würtemberg	7,675	1.881,505	245
4. Saxony	6,777	2,760,586	407
5. Baden	5,851	1,507,179	257
6. Mecklenberg-Schwerin	4,834	553,785	114
7. Hesse	2,866	884.218	307
8. Oldenburg	2,417	319.314	132
9. Brunswick	1,526	327,493	214
10. Saxe-Weimar	1,421	292.933	206
11. Mecklenburg-Strelitz	997	95.673	95
12. Saxe-Meiningen	933	194.494	208
13. Anhalt	869	213.565	245
14. Saxe-Coburg	816	182.599	223
15. Saxe-Altenburg	509	145,844	286
16. Waldeck	466	54,743	117
17. Lippe	445	112,452	256
18. Schwarzburg-Rudolstadt	340	76,676	225
19. Schwarzburg-Sondershausen	318	67,480	212
20. Reuss-Schleiz	297	92,375	311
21. Schaumburg-Lippe	212	33,133	155
22. Reuss-Greiz	148	46,985	317
23. Hamburg	148	388,618	2,625
24. Lübeck	127	56,912	448
25. Bremen	106	142,200	1,345
Reichsland of Alsace-Lorraine	5,580	1,531,804	227
Total	212,091	42,727,360	201

At the census of Dec. 1, 1875, the number of males was 20,986,701, and the number of females 21,740,659, being an excess of 753,958 females over males in the total population of the Empire. — Of the total pop., there are 25,580,615 Protestants, 14,868,608 Roman Catholics, 512,160 Israelites, and about 100,000 of other religious persuasions. — The number of Germans in the surrounding States (Austria, Switzerland, etc.), may be estimated at about 13,000,000, giving a total of 54,000,000 as German-speaking people.

Emigration, which formerly assumed larger proportions in Germany than in any other country of Europe, has been gradually declining in recent years. It reached its highest point in 1854, when over a quarter of a million of persons left the country, then sank gradually till 1862, in which year the number fell to 27,529, and from thence rose again, with fluctuation, till the year 1872, when there were 155,595 emigrants to the U. States alone. In 1873 the total emigration fell to 130,937; in 1874 to 75,502; in 1875 to 56 289; in 1876 to 37,803; and in 1877 to 21,964. From 1875 to 1877, the number of immigrants was nearly as large as that of emigrants. During the 22 years from 1846 to 1877, the total emigration to the U. States, which absorbs the best classes of emigrants, numbered 2,685,430 individuals. It is calculated that each presented, on the average, a money value of 200 marks, or $50, so that the total loss by this emigration amounted to $133,427,150. The gradually decreasing stream of emigration mainly flowed through Hamburg and Bremen.

By deviation to the general arrangement of this

work, and considering that the formerly independent states which now constitute the German Empire have still retained a shade of individuality, we have thought proper to consider each of these states in a separate article, under its own name. The following, therefore, is only a general outline of the German country, to which are added such information and commercial statistics as do not appear elsewhere.

The surface of *G.* is much diversified. Its S. E. and E. parts are occupied by numerous ranges of hills and mountains, sometimes separated only by narrow valleys, and elsewhere forming large elevated plains, while the N portion of the country sinks into a wide sandy moorish plain, but little raised above the level of the sea. The mountains, which may be considered as a N. branch of the great Alpine system of Europe, bear no comparison with the Alps in point of height, for the loftiest summits are not more than 5,000 ft. high; but they occupy a great space, and diverge in so many various directions through the country that it is difficult to trace them without the aid of a map. The *Fichtelgebirge*, however, in the N. part of Bavaria, may be considered as the centre and nucleus of the mountains in Central *G.*; and from it branch, in four directions, the ranges composing the watershed that divides the rivers of the Black Sea from the Baltic and the German Ocean. 1. The *Erzgebirge*, diverging N. E., forms the boundary between Saxony and Bohemia, and has its scarped side S. towards the Eger. Its E. continuations, called the *Sudetengebirge*, join the Carpathian ridge near the sources of the Oder and Vistula. 2. The *Bohemian Forest* (*Böhmerwald*) range separates Bohemia from Bavaria. It runs S. E. about 150 m., and taking a N. E. turn joins the Sudetengebirge near the sources of the Murch, in lon. 16° 40′ E. 3. The *Suabian Alps* are a low range branching off S. W. from the central point, and forming the watershed between the affluents of the Rhine and those of the Danube. S. they join the *Black Forest* range, the connection of which with the Alps is effected by a low chain skirting the Lake of Constance, and joining the main ridge at Mt. Septimer. 4. The *Thuringian* range runs N. W. from the Fichtelgebirge, and after a course of 50 m. divides into two chains, one running N. into Hanover, and forming the *Hartz* chain, the other running W under various names, nearly as far as the Rhine, and separating its waters from those of the Weser and its tributaries. The banks of the Moselle are remarkable for their varied scenery, and the valley of the Rhine unites the grandeur of a fine landscape with the appearance of a highly fertile country. To the northward of the hilly region the country sinks into plains, which fall very gradually from an elevation of about 300 feet at the foot of the hills to the level of the sea. These plains extend through Lower Silesia, Lusatia, Brandenburg, Pomerania, Mecklenburg, Holstein, Hanover, and the lower part of Westphalia. To the W. of the Elbe the flat country is almost entirely destitute of trees, and presents only a succession of level tracts, covered with heath and juniper, and of moors consisting chiefly of deep beds of turf intersected by rivers which flow in depressions from 100 to 200 feet below the general level of the plains. To the E. of the Elbe the country is more sandy, but the sandy tracts are covered with pines, and interspersed with fertile spaces of sometimes considerable extent. The beds of the rivers also are generally wider and less deep than in the western part of the plain Through the N. part of this plain a higher tract may be traced from W. to E., from Oldeslo in Holstein to Schwedt on the Oder, about 70 m. from the sea. Eastward of the Oder it continues for some distance due E., then gradually approaches the sea, terminating on the banks of the Niemen near Grodno. It seems to have formed at one time the shore of the sea, and it is on its N. sides that are found those numerous erratic blocks or boulders that have attracted so much of the attention of geologists. Though it does not rise into hills, it forms the watershed between a number of small streams that run direct to the Baltic, and others that run southward to the Elbe, the Oder, and the Vistula.

The coal-measures are widely distributed in many parts of *G.*, as Saxony, Silicia, Rhenish Bavaria, and Rhenish Prussia. *G.* is now the largest producer of coal in continental Europe. The product of coal and lignite for the 10 years from 1868 to 1877, in tons of 2,200 lbs. was as follows:

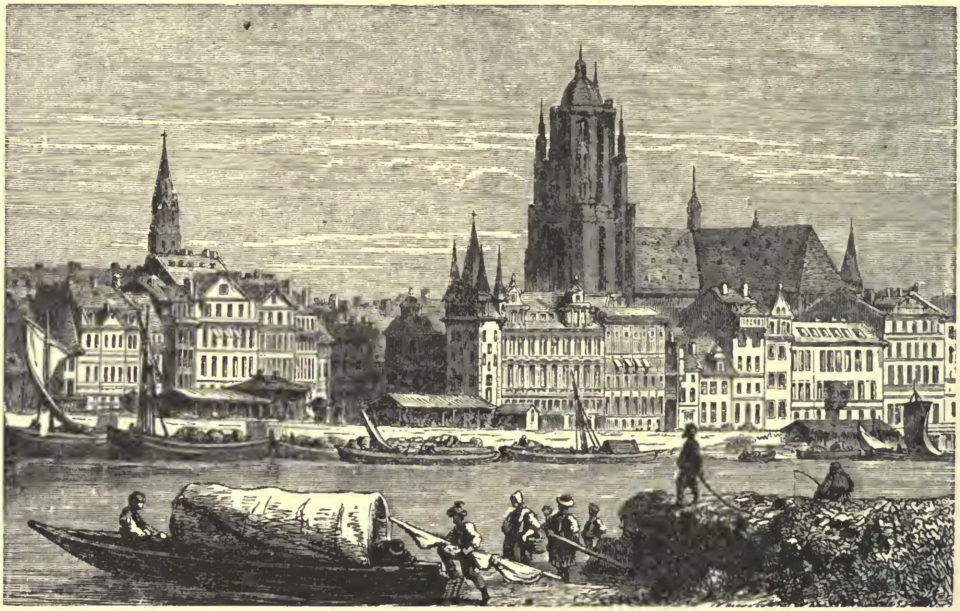


Fig. 229. — Frankfort-on-the-Main.

Coal.

	Tons.		*Tons.*
1868	25,704,758	1873	36,392,280
1869	26,774,368	1874	35,918,614
1870	26,397,770	1875	37.436,368
1871	29.373,272	1876	38 454.428
1872	33,306,418	1877	37,576,071

Lignite.

	Tons		*Tons.*
1868	7,174.365	1873	9,752,914
1869	7.569.545	1874	10.739,532
1870	7,605.234	1875	10,367,686
1871	8.482.838	1876	11,096,034
1872	9,018,048	1877	10,720,296

Of the above totals 89 per cent was sent out from the pits in Prussia. In 1877 the city of Berlin used 1,110,216 tons of coal of all kinds.

No part of Europe yields a greater variety or abundance of mineral productions, and in no part of the world are the mines worked with so much skill or so much economy. Precious stones are discovered in many parts; rock crystal, amethysts, topazes, are found in Bavaria; rock salt and Glauber salts in

various parts; and abundance of the earths calculated for making earthenware, from the coarsest description to the finest porcelain Gold is procured, though in very small quantities, by washing, in Silesia. Silver and cinnabar are raised from the mines of the Erzgebirge in Saxony. Iron, copper, tin, lead, calamine, bismuth, cobalt, nickel, titanium, arsenic, and almost every other mineral, is more or less raised from the mines. The abundance of mineral substances everywhere scattered, and which it would be difficult to enumerate, has promoted the study of mineralogy, and given birth to the school of Freyburg, whence the pupils of Werner carried the science to every part of the world. — *Soil.* The soil is generally productive. The plains in the N. have indeed much arid sandy land; but nature has provided some rich and fruitful soils along the borders of the rivers, where the most abundant harvests are gathered. The S. has also on its mountains much barren or slightly productive land; but the beautiful valleys and plains among the hills rival in fertility the best alluvial lands on the banks of the northern rivers. In general the soil in the N. is heavy, and in the S., light: the former most adapted for corn, and the latter for wines. The best soil is in the middle, between the mountains and the sandy plains. In Silesia, Franconia, Saxony, and on the Rhine, the proportion of good soil is much greater than in the N. or the S. — *Rivers.* Germany has five large rivers which pass through it to the sea, and in their course receive about 500 smaller streams, about 60 of which are navigable, either naturally or by means of artificial improvement These are the Danube, Rhine, Weser, Elbe, Oder, Etsch or Adige, and Ems, the first two of which will be found described under their own names. The Weser is formed by the juncture, at Münden, of the Werra and Fulda, which rise in the *Rhöngebirge;* its course is N. by W. till the juncture of the Allar, at which point it turns N. E., and falls into the German Ocean about 40 m. below Bremen. The Elbe rises on the N. side of the plateau of Bohemia, which, after receiving the Moldau and the Eger, it leaves at Schandau, and enters the great N. W. plain of *G.*, which it traverses to the German Ocean; its chief affluents from the S. are the Mulda and Saale from the Erzgebirge, and its principal N. tributary is the Havel. The Oder rises on the N. side of the Carpathian range, near its W. termination, and after a general N. N. W. course, and receiving many affluents, falls through the Great Haffe into the Baltic Sea. — *Lakes.* The chief of the German lakes is the *Boden See*, or Lake of Constance, on the borders of Switzerland. Along the S. shores of the Baltic or East Sea there is a number of lakes, which form the western portion of an innumerable series, extending through Prussia into Russia and Finland, and occupying comparatively higher ground than the adjoining plains and river channels. Some of these are of considerable extent, as the lake of Schwerin in Mecklenburg and the Spirding See in East Prussia, the latter, however, beyond the political limits of *G.* At the E. base of the Hartz are the salt and the sweet lakes (*Salzige* and *Susse Seen*), and to the N. of Minden, to the E. of the Weser, is a considerable sheet of water called the *Steinhuder Meer;* and to the west of the Weser is a smaller lake called the *Dummer See.* — *Climate* The climate of *G.* is very uniform in respect of the degrees of cold or heat experienced in its different regions; for though there is a difference of 8° of latitude between its S. and N. borders, that difference is compensated by the different elevations of the country, the northern part being lowland on the sea, while the midland and S. regions rise to a considerable elevation. This is indicated by the following table of places from north to south.

Places.	Latitudes.	Elevation above the sea in feet.	(Fahrenheit). Mean temperature of the climate.		
			Year.	Winter.	Summer.
Stralsund .	54°19′	51	47°	30°	63°
Berlin	52 30	140	48	31	64
Gotha.....	50 57	1,010	46	29	60
Baireuth ..	49 57	1,119	46	29	61
Ratisbon ..	49 1	1,260	48	31	64
Munich ...	48 10	1,733	48	34	65

Agriculture In the intelligent practice of agriculture *G.* is not behind the most advanced of the other countries of Europe. Mecklenburg, in particular, and Holstein are distinguished for their excellent husbandry; and in Hanover, Brunswick, Bohemia, Saxony, and some parts of Prussia and Austria, it is scarcely inferior. Generally speaking, agriculture is the principal occupation of the Germans, particularly in Bavaria, Würtemberg, Baden, Hesse, Nassau, Hanover, Brunswick, Oldenburg, Prussia, Anhalt, Holstein, and Mecklenburg; while in the Saxon duchies, Schwartzburg, and Reuss, some districts of Prussia, Bohemia, and the kingdom of Saxony, manufactures employ at least an equal, and in some cases even a greater, number of the people The greatest contrast in respect of agriculture is to be seen in Mecklenburg and Würtemberg. In the former, farming is conducted on a large scale; in the latter, as well as in other provinces, the land is divided into small parcels cultivated by small proprietors or tenants, who follow ancestral usages, and are unprovided with means to make any improvements, by draining or otherwise In the former, the *Schlagwirthschaft* prevails, according to which one immense field is covered with wheat, while another is covered with oats, a third with clover, a fourth is being ploughed and harrowed, and a fifth is feeding herds of cattle, the common size of farms being so much as 500,000 square *ruthe*, or almost 2,000 acres; in the latter, everything is grown checkerwise, in small patches, more like gardening than farming, the usual size of Würtemberg farms being only from 5 to 20 square *ruthe*, or from $\frac{1}{50}$ to $\frac{1}{10}$ of an acre. — *G.* is suitable for the cultivation of all the kinds of useful plants that belong to the temperate zones; and, owing to the equality of the climate, they are spread over all the country. Maize, however, is principally raised in the S.; wheat in the S. and W.; buckwheat in the N.; millet in the S. E.; rape-seed, poppy, anise, and cumin, in the central and N. W. districts. Flax and hemp, madder, woad, and saffron are cultivated more in the S. and central region than in the N. Tobacco is extensively raised (even for exportation to other tobacco-growing countries) on the upper Rhine, the Werra and Oder, and in Brandenburg. Excellent hops are furnished by Bavaria and Brunswick. Beets are raised in enormous quantities for the manufacture of sugar, and their cultivation has almost entirely superseded the grain-culture in the Prussian prov. of Saxony, Anhalt, Hesse-Darmstadt, and S. Bavaria. Chiccory, as a substitute for coffee, is raised in the country between the Elbe and Weser rivers. In garden culture Würtemberg, Bavaria, Hesse, and the Saxon duchies hold the highest rank. The fruit raised on the banks of the Rhine and Neckar, in Saxony and N. W. Bavaria, is of the very best quality to be found anywhere. Peaches and figs ripen only in localities protected from the cold. The apples of Saxony are of the choicest kind, and are exported to Russia in large quantities. Marron chestnuts, almonds, etc., are raised in the S. W. states. Great attention is paid to the improvement of fruit. The culture of the vine extends to lat. 51 30′ (see GERMANY, WINES OF). The culture of forests is conducted upon a more scientific basis than in any other country. Having in former times thoughtlessly destroyed their forests, many German states have been compelled to replant them in order to satisfy the wants of agriculture and industry. In many states the forests mostly belong to government, and are as carefully kept as gardens; but even private owners are prohibited by law from wasting their forests without regard to the public good. The most extensive forests are found in central and southern *G.* and in the eastern provinces of Prussia. The entire superficies of woodland in *G.* is 52,939 sq. m., of which Prussia has 31,423, Bavaria 9,376, and Würtemberg about 2,296.

Manufactures. In many branches of manufacturing industry *G.* has reached a high degree of excellence. German linen is known to the whole world; and the linens of Bielefeld and Silesia in particular are equally valued in America as in Europe. The introduction of cotton, however, has tended greatly to lessen the cultivation of flax, which was formerly a principal staple of agricultural industry, and the linen manufacture has suffered in consequence. With the improvement of the breeds of sheep, the woollen manufacture has made great progress, the German cloth being now not merely equal but even superior in quality to the cloths of England and Belgium. The chief seats of the cloth manufacture are in Brandenburg, Saxony, and the Prussian Rhenish provinces, from which it is exported to all parts of the world. The cotton manufacture has recently assumed very large proportions, the number of spindles in 1879 being estimated at 6,000,000. The German silk fabrics equal the English in quality. The principal silk manuf. are in the Prussian cities of Berlin, Elberfeld, and Crefeld, and in Saxony. The export of silk fabrics from *G.* is nearly equal to the domestic consumption. Works in metal, especially iron and steel, are produced in great perfection, and large quantities in Rhenish Prussia, Westphalia, and the district of the Hartz; brass work, in Rhenish Prussia, Bavaria, and Brandenburg; gold and silver work in Augsburg and Berlin. Pottery and glass-making have reached a high degree of perfection; the porcelain of Vienna, Berlin, and Meissen, is much in request, on account not only of the fineness of its material, but also for the tasteful elegance of its forms and ornaments. Bohemian glass is to be met with in all parts of the world. The manufacture of leather is particularly extensive in Rhenish Prussia; of soap, tallow wares, and wax, in many places. Paper-making is carried on to a great extent, and of late has been very much improved in quality. Sugar-refining is carried on in Hamburg, Berlin, Potsdam, and other places; brewing of beer, to a great extent, in Bavaria; and ardent spirits (Branntwein), to a still greater extent in the N. Ship-building and the connected trades are daily assuming more importance German industry is much distinguished in the making of mathematical, physical, surgical, and musical instruments; the chief seats of these branches of trade being Munich, Berlin, and Cassel. German clocks and wooden articles, manufactured in the Tyrol and other mountain provinces, are exported to all parts of the world The great progress which the Germans have made in manufacturing industry within the last half-century is chiefly the result of extraordinary exertions on the part of the German

governments. In every district exist industrial schools, and in all the chief towns there are schools and institutions for instruction in the higher branches of art, where pupils are trained in both practice and theory at the expense of the government. — The results of an agricultural census taken in 1873 showed that at that date there were in the Empire 3.352,231 horses; 13,315 mules and donkeys; 15,776,702 head of cattle; 24,999,706 sheep; 7,124,088 swine; 2 320,002 goats; and 2,333,484 beehives. The number of families possessing livestock (*viehbesitzende Haushaltungen*) was found to be 5,028,023, and of these there were 2,965,856 devoted partly or wholly to agricultural pursuits.

books. Great wool-markets are likewise held in Berlin, Breslau, Dresden, Magdeburg, Prague, Stettin, etc.

The *foreign commerce* of *G.* is of considerable importance. The total value of imports in 1877 was $967,000,000; of exports, $641,600,000. The three free towns (see BREMEN, HAMBURG, LÜBECK) are the chief gates of commercial intercourse of *G.* with foreign countries. The subjoined tabular statement exhibits the growth of the commercial intercourse between *G.* and the U. States, giving the total value of the imports of American home and foreign produce into the Empire, including the Hanse towns, and the total value of direct exports from there to the U. States, for the 20 years 1859 to 1878: —

YEARS.	Imports from the U. States.		Total imports.	Exports to the U. States.	Total imports and exports
	Domestic.	Foreign.			
1859	$14,943,310	$1,234.648	$16,177,958	$17.766,341	$33,944,299
1860	14.848,482	3,579,476	18,427,958	18,535,071	36,963,029
1861	10,298,802	2,314,191	12,612,993	15,369,868	27.982,861
1862	12,672,646	2,316,208	14,988,854	14.930,702	29,919,556
1863	12,415,897	1,729,408	14,145,305	13.483,309	27,628,614
1864	13,669,507	2,125,394	15.794,901	13,845,163	29,640.064
1865	19,994,560	3,512,157	23,506,717	9 567,519	33,074,236
1866	26,398,700	1,939,860	28.338,560	26,447,215	54.785,775
1867	27,041,609	2.221,278	29,262 887	26,596 594	55.859,481
1868	39,448,763	2.780.708	42.229,471	22.384,703	64,614.174
1869	39,871,814	1,386,201	41,258,015	25 270,596	66,528,611
1870	41,541,761	1,206,093	42,747,854	27.397,958	70,145,812
1871	34,610,021	855,008	35,465,029	25.093,635	60,558,664
1872	40,144,642	1,074.542	41,219,184	46,245.817	87,465,001
1873	61,767,997	1 764,099	63.532,096	61,497.954	125,030,050
1874	64,344,622	1,369,088	65,713,710	44,074.252	109,787,962
1875	52,517,913	1,244,332	53,762,245	40,893.386	94,655,631
1876	51,107,147	1,467,320	52,574,467	35,488,117	88,062,584
1877	58,192,511	655.303	58,847,814	33.035.485	91,883,299
1878	54,111,249	874,843	54,986,092	34,808,253	89,794,345
Total	689,941,953	35,650,157	725,592,110	552,731,938	1,278,324,048

Commerce. The trade and commerce of the Empire are under the administration and guidance of special laws and rules, emanating from the *Zollverein*, or Customs' League, which embraces the whole of the states of *G.*, with the exception of the two cities of Hamburg and Bremen. The privilege of Hamburg and Bremen to remain "free ports," conceded in 1868, was ratified in the Imperial Constitution of April 16, 1871, the 34th article of which enacts that the two Hanse towns shall remain "outside the common line of customs until they themselves demand admittance." The administration of the Zollverein is at Berlin. There was, previous to the year 1871, a twofold representation of the Zollverein, that of governments, in the Zollverein Council, and that of populations, in the Zollverein Parliament, the members of which latter body were elected in the same manner as the deputies to the North German Federal diet, and met in annual session at the beginning of the year. Under the constitution of April 16, 1871, the functions of the Zollverein Parliament merged in the Reichstag of the Empire. The Zollverein Council has three committees sitting permanently, namely, for finance, for taxes and customs, and for trade. All the receipts of the Zollverein are paid into a common exchequer, and distributed, *pro rata* of population, among the states of the Empire. The chief sources of revenue are customs duties, mainly on imports, and taxes upon spirits, wine, sugar manufactured from beet-roots, and tobacco. By the Zollverein free trade was established among all its members, while a high tariff protected their industry against foreign competition. Under this system *G* has rapidly progressed, and from an exporter of raw products of the soil, as it was 50 years ago, it has become one of the principal exporters of an endless variety of industrial products, and importer of raw materials. A new tariff was introduced in 1879, which greatly increases the duties on imports; for which see TARIFFS in the Appendix at the end of this book. The principal seats of the inland trade are Berlin, Breslau, Cologne, Magdeburg, Frankfort-on-the-Oder, Naumburg, Posen, Traustadt, Aachen, Coblentz, Elberfeld, Erfurt, Munster, Minden, and others, in Prussia; Leipzig, in Saxony; Munich, Augsburg, and Nurnberg, in Bavaria; Frankfort-on-the-Main, Cassel, Brunswick, Hanover, Mentz, etc. But of all these places three hold the first rank: Augsburg, for the S. W.; Frankfort-on-the-Main, for the N. W.; and Leipzig, for the N. E. Large fairs are held twice or thrice a year in Leipzig, the two Frankforts, Brunswick, and other places; but it is only in those named that these fairs are of much importance. Those of Leipzig are celebrated for the sale and exchange of

The two following tables give the declared value of the principal articles of American produce and manufacture imported into *G.*, and of the principal articles of German produce and manufacture exported to the U. States, in the year 1878: —

Imports from the U. States in 1878.

Free of duty.	
Bolting cloths	$44,707
Books	39,131
Chemicals, drugs, etc	812,667
Fur skins, undressed	129,339
Hides and skins	228 301
Wearing apparel	62,137
India-rubber, crude	56.516
Oil, volatile	46,824
Rags	385,810
Raw silk	27,364
Dutiable.	
Beer	57,837
Books and engravings	404,035
Bristles	591,895
Buttons of all kinds	1,683,790
Chemicals, drugs, etc	454.928
Chicory	76,882
Clothing	638,670
Cotton (manuf. of)	6,772,056
China ware	265,098
Fancy goods	1,059,179
Fish (pickled herring)	23,475
Flax (manuf.)	647,669
Fruits and nuts	578,768
Furs	305,655
Glass and glassware	1,102,093
Hair (human)	101,700
India-rubber (manufactured)	38.514
Iron (bar)	67,140
" anchors, chains, etc	29,573
Iron machinery	$33.830
" steel	50,816
" cutlery	329,810
" other manuf. of	234,576
Jewelry	87.106
Leather	493,218
" gloves, etc	1,520,414
Marble (manuf.)	40,701
Metals and compositions of	277,168
Musical instruments	424.209
Oil, volatile	20 349
Paintings, etc	172,105
Paints	102,092
Paper (manuf. of)	756,034
Perfumery	115,798
Precious stones	8,214,511
Provisions (meats, cheese, etc.)	98.805
Salt	1.198.426
Silk (manuf. of)	5,638,862
Straw (manuf. of)	70.204
Tobacco (leaf)	38,587
Watches	585,189
Wine	215,914
Wood (cabinet ware, etc.)	174,938
Wool	51,858
" cloths and cassimeres	1,574,163
" shawls	102,062
" dress-goods	625.450
" hosiery, etc	1,520,200
Zinc	50,918
All other articles	219,289
	$34,808,253

Exports to the U. States in 1878.

Agricultural implements	$398,029	Rosin and turpentine	$514,446
Horned cattle	87,648	Mineral oil, crude	282,212
Bark for tanning	20,319	" refined	11,630,546
Black bone	49,787	Oil, volatile	99,982
Books	39,253	Paintings and engravings	55,668
Brass goods	97,764	Paper and stationery	42,683
Indian corn	1,082,109	Plated ware	22,199
Rye	535,023	Bacon and ham	2,201,208
Wheat	43 269	Beef, salted or cured	151,518
Wheat flour	53.350	Butter	434,596
Carriages (parts of)	23 838	Fish, cured	97,319
Clocks	69.327	Lard	7,413.937
Copper	529,218	Meat, preserved	262,062
Cotton	13,339.719	Oysters	22 344
" (manuf.)	116,234	Pork	49,961
Drugs, chemicals	125,437	Seeds	707,426
Dyestuffs	356,346	Sewing-machines	465.977
Fancy articles	51,845	Spermaceti	49.066
Apples (dried)	66,770	Spirits of turpentine	153,278
Fruits in cans	27,486	Starch	206,810
Glass and glassware	32.996	Sugar, refined	20.022
Gold and silver	119,862	Tallow	281.468
Hemp (manuf. of)	31,780	Tobacco (leaf)	5,761,099
Hides and skins	280,937	" (manuf.)	164.494
India-rubber (manufacture of)	42,744	Sailing vessels	123 000
Iron steam-engines	467,500	Wearing apparel	76,840
" machinery	255,901	Whalebone	62,432
" other manuf.	140,174	Wood, and manuf. of	498.494
" edge tools	30,874	Zinc	190,386
Fire-arms	172,288	All other articles, each under $20,000	1,991,703
Manuf. of steel	22,835		
Leather	1,638,723		
" manuf. of	97,297		
Marble manuf.	42,167		
Organs	51,416		
Piano-fortes	28,407		$54,111,249

The commercial navy of *G.* was composed as follows in 1877: —

Principal Ports.	Sailing Vessels and Steamers.		Steamers.	
	No.	Tonnage.	No	Tonnage.
Hamburg	439	214.898	96	83.826
Bremen	255	196,011	58	57,676
Rostock	374	106,580	8	3.795
Stettin	222	48,630	43	8,522
Dantzic	114	48,840	8	3,293
Stralsund	292	49,879	1	237
Barth	231	42,937	..	......
Memel	91	30,911	6	320
Elsfleth	123	37,094	1	20
Papenburg	158	22,916	..	......
Geestemünde	57	27,313	6	1,487
Small and river ports	2,453	277,611	91	21,770
Total, 1877	4,809	1,103.650	318	180.946
" 1876	4,745	1,084,882	319	50,756
" 1875	4,602	1,068,383	299	48,422
" 1874	4,495	1,033,725	253	41,745

The movements of shipping in the German ports in 1876 were as follows: —

States.	Total Vessels.		Total Steamers.	
	Vessels.	Tons.	No.	Tons.
Entered.				
Prussia	31,710	3,131,344	5,040	1,386,995
Hamburg	4,991	2,180,451	2,903	1,721,048
Bremen	1,972	672,180	456	386,757
Lübeck	2,532	324,229	921	177.560
Oldenburg	2.568	169,961	90	25,932
Mecklenburg	1,060	106,514	108	20,872
Total	44,833	6,584,679	9,518	3,719,164
Cleared.				
Prussia	31.586	3,173.138	5,079	1 414.362
Hamburg	5,212	2,229,968	2,907	1,728.509
Bremen	2,116	703,429	470	402,467
Lübeck	2,516	322,764	915	176.171
Oldenburg	2,716	177,990	88	27,670
Mecklenburg	1,115	118,530	117	21.453
Total	45,261	6,725,819	9,576	3,770,632

On January 1, 1878, the total length of the railroads of the Empire completed and open for public traffic (in kilomètres) were as follows: —

States.	State roads.	Private roads under State administration.	Private roads.	Total.
Prussia	4,775.42	3,225.05	9,386 07	17 386 54
Bavaria	3,246.42	272 46	957 42	4.476 30
Saxony	1,666.89	37.54	273.75	1 978.18
Würtemberg	1,223 80	....	16.50	1.240 30
Baden	1,048.75	124.0	6 78	1,179 53
Hesse	287.36	....	433 94	721 30
Oldenburg	254 33	33 49	46 94	334.76
Mecklenburg	80.0	....	411.3	491 3
Brunswick	21.2	....	307.1	....
Other States	155 07	56 0	871 95	1,083 02
Alsace-Lorraine	1,062.57	....	10 9	1 073 47
Total	14,181.01	3,748 54	12,372.65	30,303 00
English miles	....	....	....	18,957 47

The total number of telegraphic despatches in the year 1877 was 10,649,994, of which 7.172,124 were inland, and 3,477,870 foreign. The length of telegraph lines in the Empire in 1878 was 38.793 kilomètres (or 24,317 miles), and of telegraph wires 142,000 kilomètres (or 88,750 miles) The total receipts of 1877 amounted to 10,258,529 marks, or $2,564,600, and the expenditure to 15,958,543 marks, or $3,989,635. There were 4,532 telegraph stations in 1878.

The Imperial post-office carried 516.407.730 letters, 78,586,580 post-cards, 7,523,180 patterns, 92.867,490 stamped wrappers, and 310,421,781 newspapers, in the year 1877. The total receipts of the post-office in 1877 amounted to 116,967,739 marks, or $29,241.935, and the total expenditure to 109.414,845 marks, or $27,353,710, leaving a surplus of 7,552,894 marks, or $1.888,225.

Finances. The common expenditure of the Empire is defrayed, according to Art. 70 of the Constitution, from the revenues arising from customs, certain branches of excise, the profits of the post, and telegraphs. Should the receipts from these various sources of income not be sufficient to cover the expenditure, the individual states of Germany may be assessed to make up the deficit, each state being made contributory in proportion to its population. The common expenditure is to be voted, "as a rule" (*in der Regel*) only for one year; but also for any longer term "in special cases" (*in besondern Fallen*). The financial year, formerly coeval with the calendar year, was made to run from the 1st of April to the 31st of March in 1877. The budget accounts of the Empire distinguish between ordinary or "continual" (*fortdauernde*) expenditure, and extraordinary, or "for once" (*einmalige*) disbursements The estimated total ordinary, or "continual" expenditure for the financial year ending March 31, 1879, was distributed as follows: —

	Marks
Chancellor of the Empire	104,980
Chancery of the Empire	4,259.253
Imperial Diet	322,000
Foreign Office	6,104,655
Administration of the Imperial army	322,518.283
Administration of the navy	24,110.520
Interest of the debt of the Empire	6,781,500
Chamber of Accounts	450,510
Imperial Chancery for Alsace-Lorraine	171,760
Railroad Office of the Empire	272,750
General pension funds	17,553,205
Empire invalid funds	32,053,157
Administration of justice	806,182
Total ordinary expenditure	415,508,755

The extraordinary expenditures were thus estimated: —

	Marks.
Chancellor and chancery	2,530.000
Imperial Diet	30,000
Foreign Office	527,000
Imperial Post and Telegraphs	13,299,345
Army of the Empire	27,378 540
Administration of the navy	34,580.165
Chamber of Accounts	10,000
Railroads of the Empire	10,102,340
Mint	22,700,000
Expenditures in remission of war taxes, France	9,995.325
Court of Imperial Judicature	35,000
Total extraordinary expenditure	120,987,715
Ordinary expenditure	415,508,755
Total expenditure	536.496,470
	$127,690,149 86

The receipts for the same year embraced the following branches of Imperial revenue: —

		Marks.
1.	Customs and excise duties..................	250,326,840
2.	Stamp duties..............................	6,653,100
3.	Profits of posts and telegraphs............	15,288,408
4.	State railroads in Alsace-Lorraine..........	11,356,000
5.	Imperial Bank and other receipts...........	2,010,000
6.	Receipts of various descriptions............	7,495,522
7.	From the Imperial funds for invalids........	32,053,152
8.	Surplus of former years....................	34,663
9.	Profits from the coining of Imperial money..	100,000
10.	Interest of Imperial funds..................	7,324,208
11.	Extraordinary receipts.....................	116,535,056
12	Contributions of states to revenue..........	87,145,516
13.	Administration of the Imperial printing-office	174,330
	Total..............................	536,496,800
		$127,686,238.40

The contribution of the principal states of the Empire to the revenue for the year 1878-79 was calculated as follows: Prussia, 41,494,609 marks; Bavaria, 19,682,751 marks; Würtemberg, 6,806,586 marks; Baden, 4,836,566 marks; Saxony, 4,575,727 marks; and the Reichsland Alsace-Lorraine, 3,060,410 marks. In the budget of the Empire the sums received from France as war indemnity were not entered, but placed to a separate account. Of the war indemnity, agreed upon by Treaty of Feb.

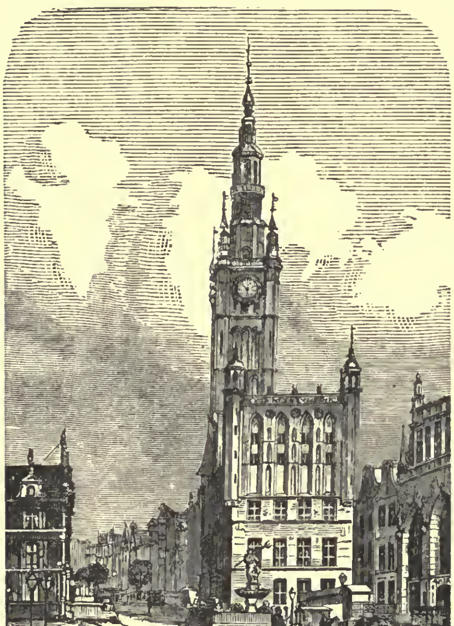


Fig. 230 — Town-Hall, Dantzic.

26, 1871, amounting to 5 milliards of francs, or $1,000,000,000 *G* had received the total at the end of September. 1873 Besides this treaty indemnity, *G* received a tribute of $30,000,000 from the city of Paris, and levied contributions in some of the French departments, the total sum paid into the Imperial exchequer amounting, inclusive of interest, to about $1,100,000,000. Of this sum nearly one half was portioned out among the 25 States of the German Empire Of the other half, in accordance with various laws passed by the Reichsrath, $62,500,000 were paid to France for the Alsace-Lorraine railways, and $30,000,000 for the fortresses in the Reichsland. —The German Empire, as such, had no public debt at the time of its re-establishment, in 1871, but one has been created in recent years At the end of June, 1878, the total funded debt amounted to 175,216,186 marks, or $43,804,045, including a loan of 97,484,865 marks, or $24,371,215, granted by a law of the Reichstag, passed June 14, 1878. The whole debt bears interest at 4 per cent Besides the funded there exists an unfunded debt, represented by "Reichs-Kassenscheine," or Imperial treasure bills, now outstanding to the amount of 168,954,850 marks, or $42,238,715. As a set-off against the debt of the Empire, there exist a variety of invested funds, of a total amount of 865,487,928 marks, or $216,371,980. These funds comprise an "Invalidenfond" of 562,748,410 marks, or $140,687,100; a "Festungsbaufond" of 153,976,402 marks, or $38,494,100; and a "Kriegsschatz" of 120,000,000 marks, or $30,000,000. The funds were created out of the French war indemnity, and are yearly increasing by interest, notably the last of them, the "Kriegs-schatz," or war-treasure, which can be drawn upon only in case of a foreign war, or invasion.

Banking. See the names of the principal states

Money. Uniformity of coinage was established by a law of 1872, the unit of account being the *mark* = 23.8 cents, divided into 100 pfennige

The new coins are as follows: —

Gold. The twenty-mark (69¾ to 1 lb. of fine gold), ten-mark, and five-mark.

Silver The five-mark (20 to 1 lb. of fine silver), two-mark, one-mark, fifty pfennige (200 to 1 lb. of fine silver), and twenty pfennige.

Nickel. Ten pfennige and five pfennige.

Copper. Two pfennige and one pfenuig

The old denominations were: —

The	*Crown*, gold coin common to all *G*., approximate value	= $6.58.
"	*Thaler*, or 30 *Groschen*, approximate value	= 0.75.
"	*Gulden*, or florin, of 60 *Kreuzer*, app value	= 0.42.
"	*Mark Current*, of Lübeck, approximate value	= 0.31.
"	*Mark Banco*, of Hamburg, approximate value	= 0 37
"	*Reichs Thaler*, of Bremen, approximate value	= 0 33

Weights and Measures The French metrical system has been adopted, and made compulsory from Jan 1, 1872. The following are the principal weights and measures used in commerce: —

The	*Gramme*	= 15.434 grains troy.
"	*Kilogramme* of 2 *Pfund*	= 2.205 lbs. avoirdupois.
"	*Centner* of 50 *Kilogramme*	= 110 " "
"	*Quintal* of 2 *Centner*	= 220 " "
"	*Tonne* of 20 *Centner*	= 2200 " "
"	*Liter, Mass*	= 1 76 Imperial pints.
"	*Meter, Stab*	= 3.28 feet or 39.37 inches.
"	*Kilometer*	= 1093 yards or nearly 5 [furlongs.
"	*Hektar*	= 2.47 acres
"	*Quadrat*, or *Square Kilometer*	= 247 acres, or 2⅗ sq k. to 1 sq. mile.

Seaports.—Besides Hamburg, Bremen, and Lübeck (for which see their respective names), the following are the principal commercial and military seaports of *G.* · —

Dantzic, a strongly fortified city, and one of the principal emporiums of the north of Europe, in West Prussia, 253 m. N. E. of Berlin, in lat. 54° 20′ 48″ N., lon. 18° 38′ E. It is situated on the left or W. bank of the Vistula, about 4 m. from its embrochure. There is a harbor in the town, but the principal port is at Menfahrwasser, at the mouth of the river. The town is traversed by the small river Motlau, which has been rendered navigable for vessels drawing 8 or 9 feet of water. The road or bay of Dantzic is covered on the W. side by a long, narrow, low, sandy tongue of land, extending from Reserhoft Point (on which is a lighthouse), in lat 54° 50½′, lon. 8° 23′ 15″, upwards of 20 m. in an E. by S. direction, having the small town of Heela, or Heel, near its termination. A lighthouse, elevated 123 feet above the level of the sea, stands within about ½ mile of the extremity of this point. The flashes of the light, which is a revolving one, succeed each other every ½ minute. There is good anchorage in the roads for ships of any burden; but they are exposed, except immediately under the Heel, to the N. and N. E. winds. There are harbor lights at the entrance to the port All ships entering the Vistula must heave to about a mile off the port, and take a pilot on board; and pilots must always be employed in moving ships in the harbor, or in going up and down the river. The usual depth of water at the mouth of the river is from 12 to 13 feet; in the harbor, from 13 to 14 feet; at the confluence of the Motlau with the Vistula, from 9 to 9½ feet: and in town, from 8 to 9 feet. Moles have been erected on both sides of the entrance to the harbor: that on the E. side, which is most exposed, is constructed of granite; the other is partly of stone and partly of timber. Dantzic is a naval station, with docks, magazines, and a marine depôt. The manuf. of arms and artillery is carried on to a large extent, and the Imperial and private docks give employment to a great number of workmen. The town is still famous for its amber, beer, brandy, and the liquor known as *Danziger Goldwasser*; and its transit trade is of considerable importance. Its harbors are visited annually by about 2,000 sea-going vessels, besides an immense number of smaller craft employed in river navigation. The chief exports are grain, especially wheat, which comes for the most part from Poland, and timber. The principal imports are herring coal, petroleum, salt, and wine. The annual value of the imports by sea, river, and railroad is about $37,000,000; that of exports, $32,000,000 Pop 98,181

Emden (formerly *Embden*), a maritime town in the district of Aurich, prov. of Hanover, situated near the mouth of the Ems, on the Westphalian Railroad, 45 m. W. N. W. of Oldenburg. The town is much intersected by canals, and more than 30 bridges are required to connect its different parts. It has a considerable maritime trade, chiefly in corn, butter, cheese, and wood. Its industries are ship-building, tanning, and the manuf. of paper, cement, and tobacco. Pop 12,874.

Kiel, a strongly fortified seaport, naval station, and arsenal of Prussia, on the N. shore of the prov. of Holstein, at the bottom of a beautiful bay, and at the terminus of a line of railroad from Hamburg. The harbor is safe, and has water sufficient for large ships. Its industries are ship-building, hats, starch, tobacco, and sugar. Pop. 34,816.

Konigsberg, the capital of East Prussia, in lat 54° 42' 11" N., lon 20° 29' 15" E. It is situated on the Pregel, which flows into the Frische Haff, or Fresh Bay, a large lake having from 10 to 14 feet of water. The bar at the mouth of the Pregel has only from 10 to 11 feet water, so that vessels of more than that draught of water require to be lightened to come up to Königsberg. Pillau, in lat 54° 33' 39" N., lon. 19° 52' 30" E., on the N. side of the entrance from the Baltic to the Frische Haff, is properly the port of the town, with which it is connected by railroad. A lighthouse is on a rising ground a little to the south of Pillau, the lantern of which is elevated 95 feet above the level of the sea. The light is fixed and brilliant. The entrance to the harbor is marked by buoys; those on the larboard side being surmounted by small flags. A Gothic building, 120 feet above the level of the sea, has been erected to serve for a landmark; at a distance it looks like a three masted ship under sail. There is usually from 15 to 16 feet water between the buoys on entering the harbor: but particular winds occasion material differences in this respect. Being situated on a navigable river of considerable importance, Königsberg has a large command of internal navigation, and is the principal emporium of a large extent of country. Wheat, rye, and other species of grain are the chief articles of export. More tares are shipped here than from any other port in the Baltic. The price of all sorts of grain is usually lower at Königsberg than at the neighboring Prussian ports. Linseed and rape seed, hemp, flax, linens, oil-cake, oil, bristles, refined sugar, etc., are largely exported; with smaller quantities of bones, mats, ashes, feathers, wax, hides and skins, etc. The bristles are the best in the Baltic. The imports are sugar, tea, herrings, iron and steel, coffee, wines, tin and tin plates, dye woods, tobacco, spices, drugs, coals, etc. In 1878 there arrived at Pillau 1,542 vessels of 171,126 tons, of which one third were British. Pop. 122,636.

Memel, a commercial town of East Prussia, in lat. 55° 43' 40" N., lon. 21° 6' 10" E. 74 m N. E. of Königsberg. It is situated on the N. E. side of the great bay, denominated the *Currische Haf*, near its junction with the Baltic. It is consequently the principal entrepôt of the country traversed by the Niemen, and as such enjoys a pretty extensive commerce. Its principal industries are ship-building, and woollen and soap manufactures. The harbor of Memel is large and safe; but the bar at the mouth of the Currische Haf has seldom more than 17 feet of water, and sometimes not more than 13 or 14 feet; so that ships drawing more than 16 feet of water are frequently obliged to load and unload a part of their cargoes in the roads, where the anchorage is but indifferent, particularly when the wind is N. or N W. There is a light on the N. E. side of the entrance to Memel harbor, 98 feet above high water, and visible 20 m. off. It is lighted from August 1 to May 15. The outer buoy lies in 6 fathoms of water, about a mile without the lighthouse, which bears from it S. E by E. ¾ E. The channel thence to the harbor is marked by white buoys on the N. and red on the S. side. Three beacons to the N of the town, when brought into a line, lead directly into the harbor. Inasmuch, however, as the channel is subject to frequent changes, both in depth and direction, it is always prudent, on arriving at the outer buoy, to heave to for a pilot; but this is not obligatory. Timber forms the principal article of export; for though that of Dantzic be considered better, it is generally cheaper, and almost always more abundant, at Memel. Large quantities of hemp and flax are also exported, as are bristles, hides, linseed, wax, pitch and tar, etc. The exports of grain, especially rye, are sometimes very considerable. The wheat of Lithuania is reckoned the best. All flax and hemp shipped from Memel must be *bracked*, or assorted by sworn selectors. The imports consist principally of salt, herrings, coffee, sugar, spices, dye-woods, tobacco, tea, cotton stuffs and yarn, iron, cutlery, wine, etc. This port is open to navigation throughout the year, but the navigation of the river Niemen and adjacent streams, the Currische Haf, etc., closes about the latter end of November, and opens about the middle of April. In 1878, 1,011 ships of 117,446 tons arrived at Memel. Pop. 25,000.

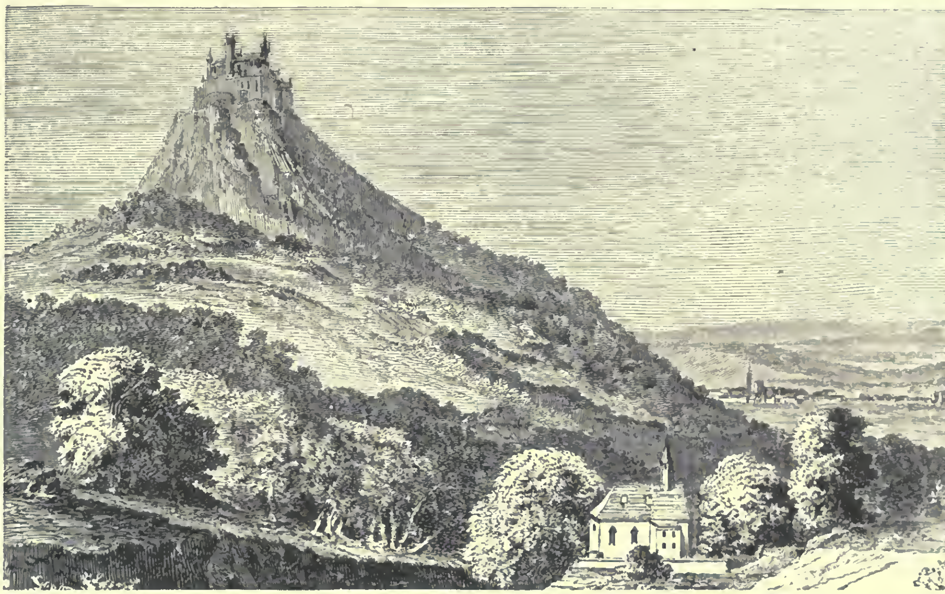


Fig. 231. — Castle of Hohenzollern.

Rostock, formerly one of the Hanse towns, and now the principal commercial city of the Grand Duchy of Mecklenburg-Schwerin, on the Warnow, about 9 m. above where it falls into the Baltic, lat. 54° N., lon. 12° 12' E. A large fair for merchandise is annually held at Whitsuntide; and there are wool fairs at other seasons of the year. The outport of Rostock is at Warnemunde, at the mouth of the Warnow. The depth of water at the latter varies from 10½ to 12 feet; but at the end of the west pier it varies from 12 to 14 feet. In the river from Warnemunde up to Rostock there is usually from 8 to 9 feet; so that vessels drawing more than this must be lightened to get up the latter. Rostock has a good harbor and commodious quays. The principal articles of import are refined sugar, coffee, cotton, woollens, iron, hardware, earthenware, hemp, flax, tallow, oil, alum, timber, herrings, fish-oil, wine, brandy, molasses, drugs, rice, rum, groceries, etc. The total value of imports by sea is about $2,000,000. The exports, whose yearly value is about $3,000,000, consist chiefly of very good wheat, wool, rags of a superior quality, oil-cake, rape-oil, bones, etc. Pop. 29,432.

Stettin, a city of Prussia, and the capital of prov. Pomerania, on the left bank of the Oder, about 36 m from its en-

trance in the Baltic, in lat. 53° 25′ 8″ N., lon. 14° 34′ E. It is well built, strongly fortified, and is the seat of an extensive commerce, which it owes mainly to its situation. The Oder, which flows through the centre of the Prussian dominions, is navigable as far as Ratibor, near the extreme S. boundary of Prussian Silesia, and is united by means of canals with the Vistula, the Elbe, the Spree, etc. Stettin is, consequently, the principal emporium of some very extensive and flourishing countries; being not only the port of Frankfort-on-the-Oder, Breslau, etc., but also of Berlin. She is also the centre of an extensive system of railroads communicating with Berlin and the west parts of Germany on the one hand, and on the other with Posen, Bromberg, and Dantzic. Hence, at the proper seasons, her wharves are crowded with lighters that bring down the produce of the different countries traversed by the river, and bring back colonial products, and other articles of foreign growth and manufacture. Vessels of considerable burden, or those drawing above 7 or 8 feet of water, load and unload, by means of lighters, at the mouth of the river at *Swinemunde*, the outport of Stettin, on the E. coast of the isle of Usedom, in lat. 53° 55′ N., lon. 14° 15′ 15″ E. Formerly there were not more than 7 feet of water over the bar adjacent to Swinemunde; but the harbor of the latter has been so much improved by the construction of piers and breakwaters, dredging, etc., that it is now the best on the Prussian coast, and admits vessels drawing from 18 to 19 feet of water. A lighthouse has been erected at the extremity of the eastern pier, in 53° 56′ N. lat., and 14° 17′ E. lon., visible 10 m. off, and there is another (visible for 21 m.) situated a mile and a half S. of the Mole Light. There are also two light-ships between Swinemunde and Stettin. Stettin is a free port; that is, a port into and from which all sorts of goods may be imported and re-exported free of duty. Pop. 80,972.

Wilhelmshaven, the most important of the three German ports of war (the others being Kiel and Dantzic), on the North Sea, in the Bay of Jader, near the mouth of the river Elbe. This port was opened by the Emperor Wilhelm I. on the 17th of June, 1869. It is a vast artificial construction of granite, and comprises five separate harbors, with canals, sluices to regulate the tide, and an array of dry docks for ordinary and ironclad vessels. The first harbor is an artificial basin, flanked by granite moles, respectively 4,000 and 9,600 feet long. This basin, called "the entrance," is 700 feet long and 350 wide, and leads to the first sluice, 132 feet long and 66 wide. The next basin, or outer harbor, is 600 feet long and 400 wide; the second sluice, immediately behind, as long and as wide as the first. Then follows a canal 36,000 feet long, varying in width from 260 to 108 feet, and having about half-way another harbor for dredging-steamers and similar craft. This leads to the port proper, consisting of a basin 1,200 feet long and 750 wide, with a smaller basin for boats. At the back of the principal harbor there are two large shipyards.

Wismar, the second seaport town of Mecklenburg-Schwerin, at the confluence of the river Stor with the sea, in lat. 53° 53′ 5″ N., lon. 11° 27′ 7″ E. The harbor is commodious and safe, being nearly landlocked by the islands of Poel and Walfisch. Close to the town there is from 8 to 8½ feet water; in the inner roads there is from 12 to 13 feet; and in the outer, from 16 to 20 feet. The articles of import and export are the same at Wismar as at Rostock; but owing to the proximity of Lübeck, from which Wismar is not more than 27 m. distant, her foreign trade is comparatively limited. Pop. 14,316.

Germany (Wines of). The Germans have wasted a good deal of idle conjecture on the antiquity of the culture of the vine in their country. While many of their writers ascribe its introduction to the Emperor Probus and his legions, about the year 280, others go up to the Asiatic Bacchus, and pretend that Bacharach, in the vicinity of which so many excellent vineyards are found, derived its name from the deity of wine; a stone still existing in the river which they call "Bacchus's altar." Had the etymology been treated metaphorically in this way, to describe the vine country on the Rhine, and some of its tributary rivers, it would not have been out of place to call it the country of Bacchus. The banks of the Rhine, Moselle, Neckar, and Main are gardens of the vine; nor have the Germans been content with cultivating the banks of rivers alone, but the higher lands are planted with the greatest success. From Bonn to Coblentz, and from the latter city to Mayence, the country is covered with vineyards. The Johannisberger of "father" Rhine, the Gruenhaeuser, or the Braunberger, of the Moselle, and the Hochheimer of the Main, each distinguish and hallow their respective rivers in the eyes of the connoisseur in wine.

Whoever has visited the noble Rhine must have felt sensible of the beauty of its vineyards, covering steep and shore, interlaced with the most romantic ruins, towns ancient and venerable, smiling villages, and the rapid broad German river, reflecting the rich scenery on its banks. From Mentz even to Bonn the vineyards of the Rhine are observed to greater advantage than any similar cultivation in other countries: Erbach, enthroned on its vines; the Rheingau, its Johannisberg on a crescent hill of red soil, adorned with cheering vegetation; Mittelheim, Geisenheim, and Rüdesheim, with its strong, fine-bodied wine, the grapes from which bask on their promontory of

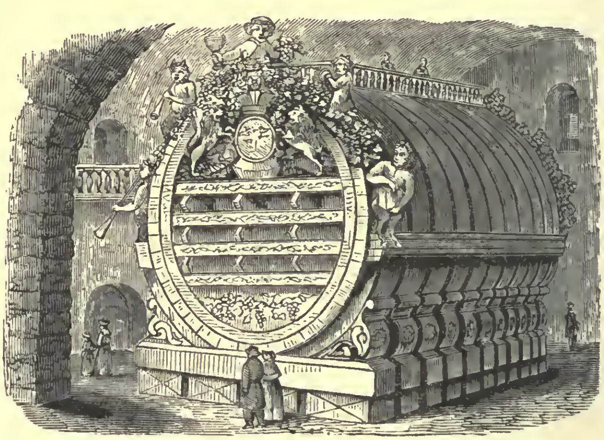


Fig. 232. — The Heidelberg Tun.

rock in the summer sun, and imbibe its generous heat from dawn to setting; then, again, on the other side, Bingen, delightful, sober, majestic, with its terraces of vines, topped by the château of Klopp. The river and its riches, the corn and fruit which the vicinity produces, all remind the stranger of a second Canaan. The Bingerloch, the ruins, and the never-failing vines scattered among them, like verdant youth revelling amid age and decay, give a picture nowhere else exhibited, uniting to the joyousness of wine the sober tinge of meditative feeling. The hills back the picture, covered with feudal relics or monastic remains, below Asmannhäusen to Lorch, mingled with the purple grape. Bacharach is near, the wine of which is very good, though it is now pronounced second-rate in quality. Landscapes of greater beauty, joined to the luxuriance of fruitful vine-culture, can nowhere be seen. To the north of Coblentz the wines are of little comparative note, though Bodendorf, near Bonn, has been said to produce a Rhenish wine of the second growth, thus far to the north. Either on the Rhine, or on its tributary rivers between Coblentz and Mayence, all the most celebrated wines of Germany are grown.

The grapes which are preferred for general cultivation are the *riessling*, a small white species, harsh in taste, but in hot

seasons furnishing a remarkably excellent wine, having a fine bouquet; the *kleinberger*, a productive species, which ripens easily; and a small Orleans variety. The vintage does not take place until the grapes are perfectly mature; they are then carefully gathered, the bad fruit picked out, and with the stalks put aside. The wine of the pressings is separated, *most vom ersten druck, vom nachdruck*. The more celebrated of these wines are all fermented in casks, and then, after being repeatedly racked, suffered to remain for years in large fudders to acquire perfection by time. These huge casks contain each about 350 tuns. The wines mellow best in large vessels; hence the celebrated Heidelberg tun, 31 feet long by 21 feet high, and holding 150 fudders, or 600 hogsheads; the second of these was built at Heidelberg in 1663. That which preceded it held but 132 fudders. This tun (Fig. 232) is decorated with all kinds of fantastical ornaments. Tübingen, Grüningen, and Königstein (the last 3,709 hogsheads) could all boast of their enormous tuns, in which the white wines of the country were thought to mellow better than in casks of less dimensions. These tuns were once kept carefully filled. The Germans always had the reputation of being good drinkers, and of taking care of the "liquor they loved."

The wines German are a distinct class in character from all other wines. They are generous, dry, finely flavored, and endure age beyond example. They average about 12.08 per cent of alcohol. They have been supposed to turn acid sooner than other wines, though the reverse is a remarkable fact. On this subject a writer observes, with respect to Moselle, and the same will hold good with other wines of Rhenish character, that, "the country which borders on the Moselle produces abundance of grapes, and some of the wines have an agreeable flavor, especially the vintage of *Brauneberg*. This highly flavored wine is a fashionable beverage at the first tables in London, and, when iced in summer, nothing can be more grateful. Some of it has the flavor of the Frontignan grape, without its sweetness. This wine has a singular quality; it is difficult to make it into vinegar. The author accidentally discovered this property by putting a few bottles into a greenhouse, and afterwards into his cellar, for the purpose of using it as vinegar; but the following spring he was surprised to find that no acetous fermentation had taken place. It has been generally supposed in England that the wines of the Rhine and Moselle are more acid than the white wines of France; but if the above experiment may be any criterion of the qualities of the former, it would prove that they are less acid than Santerne, Barsac, and the Graves; for it is well known that it is necessary to sulphur the casks of these wines to prevent the acetous fermentation taking place."

To proceed northward with the "Rhine wines," following the course of the Main River. The ordinary wines are not worthy of note. The *Liebfrauenmilch* is a well-bodied wine, grown at Worms, and generally fetches a good price. The same may be said of the wines of *Kœsterick*, near Mayence, and those from *Mount Scharlachberg* are equally full bodied and well flavored. *Nierstein*, *Oppenheim*, *Laubenheim*, and *Gaubischeim* are considered to yield first growths, but that of *Deidesheim* is held to be best. The prices vary much, and depend in a great degree upon the age of the wine. New wine may be had from 30 cents the *maas* (a little more than two quarts) to $1.25; very aged wine from $2 to $4.50 the bottle. The Main runs up to Frankfort close to Mayence, and on its banks the little town of Hochheim stands upon an elevated spot of ground, in the full blaze of the sun. From Hochheim is derived the name of *Hock*, too generally applied in England to all German wines. No trees are seen to obstruct the genial fire from the sky, which the Germans deem so needful to render their vintages propitious. The town stands in the midst of vineyards. That which produces the *Hochheimer* of the first growth is about eight acres in extent, and situated on a spot well sheltered from the N. winds. The produce, in a tolerable year, is 12 large casks, which sell for about $800 each. The whole eastern bank of the Rhine to Lorich, called the Rheingau, has been remarkable centuries past for its wines. It was once the property of the Church. The entire district is one delicious vine-garden. In this favored spot grows the castle, or Schloss-Johannesberger, once the property of the Church, and also of the Prince of Orange. Johannisberg is a town, with its castle (*schloss*), on the right bank of the Rhine below Mentz. The *Johannisberger* takes the lead in wines of the Rhine. The vines are grown over the vaults of the castle, and the quantity of wine produced is very small. The other growths near the same vineyard are excellent, and the vintage of ten years sell for $200 to $300 the cask of 30 gallons. *Rudesheim* produces wines of the first Rhine growths; but the *Steinberger*, belonging to the Duke of Nassau, takes rank after the Schloss-Johannisberger among these wines. It has the greatest strength, and yet is one of the most delicate, and even sweetly flavored. The quantity made is small, of the first growth. *Graefenberg*, which was once the property of the Church, produces very choice wine, equal to the *Rudesheim*. *Marcobrunner* is an excellent wine, of a fine flavor, especially when the vintage has taken place in a warm year. The vineyards of *Roth* and *Konigsbach* grow excellent wines. Notwithstanding the quality of endurance many of the second-rate growths possess, and a freedom from acidity equal to those which hold the first place, they are by no means so well known as they ought to be. The excellence of the wine in any particular year always depends more upon the warmth of the season than upon any other cause, and the high price of the wine in corresponding years rates accordingly. The Germans say that the wines of the best body are made on the higher lands, and the worst on the lower; the last requiring the longest keeping to render them mellow for drinking. The wines of 1811, still to be found in the trade, bear a very high character. There is something unaccountable in the extraordinary durability of wines grown so far to the N., when the slightest increase of warmth in a season causes such a difference in the quality of the wine. While strong southern wines suffer from age after a certain period of years in bottle, and begin to deteriorate sensibly, the Rhine wines seem possessed of inextinguishable vitality, and set the greater part of rivalry in keeping at defiance. It is generally found that wines with the lesser proportion of alcohol change sooner than those which are strong. The Rhenish wines, averaging so little in spirit, will endure longer and continue to improve by age as much as the more potent wines of the South, with double their alcoholic strength. On the whole, the wines of Bischeim, Asmannhausen, and Laubenheim are very pleasant wines; those of the most strength are Marcobrunner and Niersteiner, while those of Johannisberg, Geissenheim, and Hochheim give the most perfect delicacy and aroma. The Germans themselves say, *Rhein-wein, fein wein: Necker-wein, lecker wein; Franken-wein, tranken wein, Mosel-wein, unnosel wein.* ("Rhine wine is good; Neckar pleasant; Frankfort bad; Moselle innocent.")

The red wines of the Rhine are not of extraordinary quality. The *Asmanshauser* is the best, and resembles some of the growths of France. Near Lintz, at Neuwied, a good wine, called Blischert, is made. Keinigsbach, on the left bank of the Rhine, Altenahr, Rech, and Kesseling yield ordinary red growths.

The Moselle wines are secondary to those of the Rhine and Main. The next celebrated is the *Brauneberger*. The varieties grown near Treves are numerous. The wines are light, with a good flavor. They will not keep so long as the Rhine wines, but they are abundant and wholesome. Near Treves are grown the wines of *Brauneberg*, *Wehlen*, *Graach*, *Zeltingen*, and *Piesport*. The wines of *Rinsport* and *Becherbach* are considered of secondary rank, the wines of *Cassel* and *Valdrach*, near Treves, are thought to be possessed of diuretic properties, and even to cure the gravel. In about five years these wines reach the utmost point of perfection for drinking. They will not keep more than ten or twelve years in prime condition.

The wines called "wines of the Ahr" resemble those of the Moselle, except that they will keep longer.

The *wines of the Neckar* are made from the best French, Hungarian, and even Cyprus vines. The most celebrated are those of *Bessingheim*. They are of a light red color, not deep, and of tolerable flavor and bouquet. Wiesbaden grows some good wines at Schierstein, and Epstein, near Frankfort. The best wines of Baden are produced at Badenweiler, near Fribourg. At Heidelberg the great tun used to be filled with the wine of that neighborhood, boasted to be a hundred and twenty years old, but it gave the wine no advantage over other Neckar growths. Some good wines are produced near Baden. The red wines of Wangen are much esteemed in the country of Bavaria, but they are very ordinary. Wurtzberg grows the Stein and Liesten wines. The first is produced upon a mountain so called, sold very dear, and called *wine of the Holy Spirit* by the Hospital of Wurtzberg, to whom it belongs. The Liesten wines are produced upon Mount St. Nicolas. *Straw wines* are made in Franconia. A *vin de liqueur*, called Calmus, like the sweet wines of Hungary, is made in the territory of Frankfort, at Aschaffenbourg. The best vineyards are those of Bischofsheim. Some wines are made in Saxony, but they are of little worth. Meissen, near Dresden, and Guben produce the best. Naumberg makes some small wines, like the inferior Burgundies.

Most of the so-called Rhine wines sold in this country are of American manufacture. The quantity of German wines imported in the year 1878 was only 204,084 gallons (in casks), valued at $130,090; and 11,401 dozen bottles, valued at $85,124. See SPARKLING WINES.

Geropiga, a strong, sweet, high-colored compound, consisting of brandy at 25 degrees over proof, coloring and sweetening matters, and unfermented grape-juice, manuf. and used in Portugal to adulterate various kinds of wines, and exported in pipes containing about 100 gallons. This factitious and noxious liquor was formerly largely imported into this country.

Ghazilieh, a Turkish mixed fabric, half cotton and half silk, made in pieces about 8 yards long.

Ghee, liquid butter made from the milk of buffaloes and clarified; it is an article of very considerable commerce in various parts of India, and

is generally conveyed in dubbers or large bottles made of hide, holding from 10 to 40 gallons each. Ghee will keep sweet a considerable time.

Gherkin, a small cucumber used for pickling.

Ghetchoo, an Indian name for the *Aponogeton monostachyon*, the roots of which are nearly as good as potatoes, and as much liked by the natives.

Ghet-kol, a vernacular name in Bengal for the acrid tuber of *Arum orixense*, used for poultices, applications to snake-bites, and inwardly as a powerful stimulant.

Gib, a wood or metal piece or slip, notched or otherwise, in a machine or structure, to hold other parts together, or keep them in place: usually held in its own place by a wedge or key, or by a screw. — *Gib and key*. The fixed wedge and the driving wedge for tightening the strap which holds the brasses at the end of a connecting-rod in steam-machinery.

Giberne, a French soldier's cartridge-box.

Gibier [Fr.], game; articles pursued or taken in the chase; venison.

Gibraltar. See SPAIN.

Gibus, a spring or folding crush dress-hat.

Giddah, Giduah, an Eastern grain measure of 2 lbs. 1 oz. 14 drachms; in some places it is only 2 oz., two giddahs making one arsolah, or the eighth part of the pucca seer.

Gies, strong mats made of bark or horse-hair-looking fibres, worn by native boatmen in the Pacific, to keep off the wet.

Gig, a shearing-frame used for cropping the nap or wool from cloth. — A long, light boat. — A light two-wheeled carriage for general use.

Gig-Mill, the cylinder in a cloth manufactory on which teasels or wire teeth are fixed, to card the cloth, which is stretched on beams.

Gilbacker, a fish of British Guiana. the *Silurus Parkerii:* from the sound isinglass is made, and exported to some extent.

Gilder, one who applies gold to substances. There are many kinds of gilders, as book and card-edge gilders, electro-gilders, china-gilders, French-gilders, water-gilders, screw-gilders, and gilders of glass, leather, etc.

Gilding, the application of a superficial coat of gold on wood, metal, and other materials. The beauty and durability of gold render it the most valuable of all ornamental substances; but, on account of its weight and high price, its use in these respects would be exceedingly limited, were it not the most extensible and divisible form of matter, so that it may be made to cover a larger surface than an equal quantity of any other body. For the sake of brevity we shall briefly notice the leading varieties of *G.*, and their application, in alphabetical order.

Burnished G. This is distemper *G.* to which a "face" has been given with the "burnisher." It is chiefly employed for the polished portions of the frames of pictures and mirrors, the more prominent parts of statuettes, etc.

Cold G. The articles (copper or brass) to be gilded, after being softened, annealed, and polished in the usual manner, are rubbed with a little *G.*-powder by means of a piece of cork moistened with a solution of salt in water; after which the work is burnished with a piece of hematite or polished steel.

Distemper G. This is applied to wood, plaster, marble, etc. It is commonly performed in this country by giving the wood, first, a coating of good size, and, next, several successive coats of size thickened with finely powdered whiting, Spanish white, or plaster of Paris, until a good face is produced, observing to let each coat become quite dry, and to rub it perfectly smooth with fine glass paper, before the application of the following one. When the proper face is obtained, the surface is thinly and evenly gone over with gold size, and when this is nearly dry, the gold leaf is applied, and afterwards burnished with an agate or dog's tooth. The process, as adopted by the Parisian artists, who greatly excel in this species of *G.*, is very complicated, and is divided into at least 17 distinct operations, each of which they declare to be essential to its excellence.

Electro-G. See ELECTRO-METALLURGY.

Grecian G. In this variety sal-ammoniac and corrosive sublimate, equal parts, are dissolved in nitric acid, and a solution of gold made with this menstruum; after slight concentration the liquid is applied to the surface of silver, which immediately becomes black, but on being heated exhibits a rich gilded surface.

Japanner's G. The surface is covered with oil-size thinned with spirits of turpentine, and gold, in powder, is gently dabbed on with a puff of wash-leather. This gives the appearance of "frosted gold." A coating of varnish is next given, followed by exposure to a gentle heat in the "stove."

Leaf G. This term is commonly applied to the *G* of paper, vellum, etc., by applying leaf gold to the surface, previously prepared with a coating of gum-water, size, or white of egg. It is usually burnished with an agate or dog's tooth.

Oil G. This species of *G* may be divided into several operations. The following are the abridged instructions of a Parisian artist on the subject: 1. The surface is prepared by a coating of white lead in drying oil. 2. Another coat is given, made with calcined white lead or massicot, ground in linseed oil and turpentine. 3 or 4 coats of this mixture are often given, at intervals of at least 23 hours, observing to carefully smooth off each coat with pumice-stone or shave-grass before the application of the following ones. 3 The "gold color," or paint, is next applied. It is usually very adhesive gold-size, or the bottom of the pot or dish in which painters wash their brushes. For this purpose it is thoroughly ground and strained. 4. When the gold color becomes partially dry and sufficiently tenacious, the gold leaf is applied and pressed on with a wad of cotton-wool or a soft brush. It is now left for several days to harden. 5. A coat of spirit-varnish is next given, and the object is cautiously passed over a chafing-dish of charcoal, observing to avoid stopping the motion of the piece whilst doing so, as the work would then become discolored and blistered. 6 The work is "finished off" with pale oil varnish. For out-door *G.* and common work the varnishing process is generally omitted. This species of *G.* is applied to wood-work, plaster, metal, etc.

Varnish G. This is a mere variety of oil *G.*, applied to equipages, furniture, mirror, and picture frames, etc, the surface being highly varnished and polished before it receives the size or gold color; and after the *G.* has become quite dry a coat of spirit varnish, fumed with the chafing-dish as above, is applied, followed by 2, 3, or more coats of the best copal varnish, at intervals of 3 or 4 days each. The whole is, lastly, carefully polished with tripoli and water.

Water G. This consists in the application of a thin coating of amalgam of gold to the metallic surface (brass, bronze, or copper) to be gilded, and the subsequent volatilization of the mercury by heat. It is the usual method of *G.* articles of copper and its alloys, and possesses great beauty and durability when skilfully executed. The occupation is, however, an unhealthy one, owing to the continual exposure of the workman to the fumes of mercury. The furnace invented by M. D'Arcet obviates this evil, as the whole of the volatilized mercury is carried off, and again condensed for further use It should, therefore, be adopted by every water-gilder who studies economy and the health of those in his employ. The process of water *G.* consists in several distinct operations, and can only be successfully performed by those who have been schooled in the art by an apprenticeship to the trade. It would, therefore, be waste of space to enter into details here. Formulæ for several of the articles employed for the purpose will be found in the alphabetical places in this work.

Among the applications of the process of gilding that deserve a separate notice are the following: —

Books. The gold letters and figures on the covers of books are thus formed: Gum mastic, in fine powder, is dusted over the surface to be gilded; an iron or brass tool bearing the design upon its face is then heated to a proper temperature, and gently pressed upon a piece of leaf gold, which slightly adheres to it; the two are then transferred to the cover, and the tool is gently pressed on it, by which means the mastic softens and retains the gold. The loose gold and powdered mastic are then dusted off with a brush. Gold leaf will adhere to leather without the use of mastic, but not so firmly as when it is employed. The edges of the leaves of books and paper are first cut perfectly smooth, and then washed over with a solution of isinglass in weak spirit, or with a varnish made of Armenian bole 4 parts, and powdered sugar-candy 1 part, mixed up to a proper consistence with strained white of egg. The coating is allowed to dry, and is then smoothed with a wet rag, after which the gold leaf is applied and polished with the burnisher.

Brass Buttons, formerly so much in demand, are covered by a rough species of wash *G.* The buttons are polished in the lathe and thrown into a pan with a little amalgam of gold, and as much aquafortis diluted with water as will wet them all over. Here they are well stirred up, until they assume a silvery appearance, when they are washed with clean water. They are then submitted to a sufficient heat, in a suitable apparatus, until the mercury is volatilized. The buttons

are next cooled, and well tossed and rubbed about with a painter's brush; and are, lastly, burnished by washing them well with beer or ale grounds. Twelve dozen (1 gross) of buttons, of 1 inch in diameter, may be perfectly gilded on both sides with only 5 gr. of gold. By an Act of Parliament, which is still unrepealed, this is the smallest quantity of gold permitted to be used for a gross of buttons of the above size.

Glass, porcelain, and *earthenware* are gilded by blending powdered gold with gum-water and a little borax, and applying the mixture by means of a camel-hair pencil; the article is then heated in an oven or furnace, by which means the gum is burnt, and the borax, vitrifying, cements the gold to the surface. It is afterwards polished with a burnisher. Names, dates, or any fancy device may thus be permanently and easily fixed on glass, china, earthenware, etc.

Japanned work is gilded by the method explained as "Jappanner's gilding" (above).

Leather is gilded in the same way as the covers of books. (See above.) For common work, silver leaf, or even tin foil, is applied to the surface, previously covered with size or white of egg, and after being burnished down and dried, is washed over with gold-colored lacquer.

Letters of sign-boards and the ornamental *G.* for out-door work are done by first covering the design with yellow paint, then with oil gold-size, and when this is nearly dry applying the leaf gold, observing to shield it properly from the wind, lest it be blown away or become crumpled before being properly attached. The work is, lastly, varnished.

Polished metals may be gilded by one or other of the methods already noticed. Articles in silver, copper, brass, and bronze are usually coated by the process of wash or water gilding; or, directly, by the application of gold leaf, as follows: The piece or article is heated to a bluish tint, and gold leaf pressed gently and carefully on it with the burnisher; heat is again applied, and the process repeated with fresh leaves of gold until the gilding has acquired the proper thickness and tone. The surface is lastly polished with the burnisher, or is colored in the usual manner at the stove. This succeeds with iron, steel, silver, copper and its alloys, etc. Another method for polished articles in iron and steel, which, however, is less durable than the preceding, is to apply an ethereal solution of gold to the surface with a camel-hair pencil. The ether flies off and leaves the surface coated with gold, which is then polished as before. In this way any fancy device or writing may be executed on steel or iron with extreme facility.

Silks, satins, woollens, ivory, bone, etc., may be readily gilded by immersing them in a solution of neutral terchloride of gold (1 of the salt, and 3 to 6 of water), and then exposing them to the action of hydrogen gas. The latter part of the process may readily be performed by pouring some dilute sulphuric acid on zinc or iron filings, in a wide-mouthed bottle, and placing it under a jar inverted, at the top of which the articles to be gilded are suspended. Flowers or other ornamental designs may be produced by painting them on the surface with a camel-hair pencil dipped in the solution. The design, after a few minutes' exposure to the hydrogen, shines with all the splendor of the purest gold, and will not tarnish on exposure to the air, or in washing.

Wire (copper, silver, or brass) is occasionally gilded, in coils, by a process similar to that adopted for *Buttons;* but more frequently as follows: Rods (usually of silver) are covered with gold foil of a thickness proportionate to the quality of the intended wire, and the compound bar is then drawn into wire, in the usual way.

Gilding Liquor is the name given to various liquids employed in *G.* Among them are the following: *Deading Aquafortis.* From mercury, 1 part; aquafortis (sp. gr 1.33), 3 parts; dissolve, and add of soft water, 3 parts. Used to produce a dead-gold effect. It is applied (diluted) to the articles, before spreading the amalgam over them, in water *G.* — *Mercurial solution.* From mercury, 10 parts, dissolved in aquafortis, (sp. gr. 1 33), 11 parts, and the solution diluted with 25 times its weight of water. Used to moisten the scratch brush before drawing it over the amalgam, in mercurial *G.*; also to deaden the gilded surface, by moistening the piece to a heat sufficiently high to drive off the mercury. — *Gilder's Pickle.* From alum and common salt, of each 1 oz.; nitre, 2 oz.; dissolved in water, ½ pint. Used to impart a rich color to gold surfaces, especially of trinkets. Its application should not be too long continued, as it dissolves a small portion of the gold. For common purposes it is best used largely diluted with water.

Gilding Metal. The metal employed as a base for *G.* is usually brass, or a mixture of brass and copper. The following proportions have been recommended: (1) Copper, 6 parts; brass, 1 part. (2) Copper, 4 parts, Bristol brass, 1 part. (3) Copper, 13 parts; old Bristol brass, 3 parts; tin, 14 parts.

Gilding Powder. Pure gold, 3 dr.; pure copper, 1 dr.; aqua regia 10 oz.; dissolve, molsten clean linen rags with the solution, dry them, and burn them to ashes. The latter contain the gold in a state of minute division, and must be carefully collected.

Gilding-Size, a pure description of size for the use of gilders.

Gilead (Balm of). See OPOBALSAM.

Gill, a liquid measure, the fourth part of a pint, and weighing 5 oz. avoirdupois of water. — A pair of wheels and a frame on which timber is carried.

Gillosanto, a pastel, or coloring substance, made of argol and rhamnus or yellow berries.

Gimbal, Gimmal, the brass ring by which a ship's compass is suspended in its box.

Gimbal-Joint, a two-part joint having articulations on axes at right angles to each other.

Gimblet, a carpenter's boring instrument, to screw round, to turn anything on its end, as an anchor round by its stock. It has a leading screw, a grooved staff, and a cross handle.

Gimmal. See GIMBAL.

Gimp, silk thread or twist, usually interlaced with a metallic wire, used for dress trimmings, in coach-lace making, and for fringes.

Gimp-Nail, a small forged nail with a rounded head, used by upholsterers.

Gin, a portable machine for raising weights, driving piles, etc., which consists of three spars set up in a pyramidal form, and furnished at top with a tackle which is worked by a windlass beneath. — A machine for opening the tufts of cotton after gathering (see COTTON).

Gin [a corruption of *geneva*], an ardent spirit, distilled from corn, and flavored with either oil of juniper or oil of turpentine. Gin was originally wholly imported from Holland, and was a rich, soft spirit, flavored chiefly with juniper berries, on which account it had obtained the name of *geneva* (from *genièvre*, the French for juniper). After a time the distillation of an imitation geneva sprung up in England, where the continental spirit came to be called *Hollands*, or *Hollands geneva*, to distinguish it from the spirit of English manufacture. The liquor at present known by the name of gin, both in England and America, is a very different article from that imported from Holland (see HOLLANDS), and consists of plain corn-spirit, flavored with oil of turpentine and small quantities of certain aromatics. The thousand and one receipts for this article, which have from time to time been printed in books, produce a flavored spirit bearing no resemblance to the more esteemed samples of English gin; and, if possible, the products are even more unlike genuine Hollands. Any person may easily satisfy himself of the truth of this assertion by actual experiment on the small scale. The cause of this incongruity has arisen chiefly from the writers not being practically acquainted with the subject, and from the disinclination of well-informed practical men to divulge gratuitously what they conceive to be valuable secrets. Hence the utter failure of any attempts to produce either gin or Hollands from the receipts usually published. Theory and experiment sometimes disagree. In practice, it is found that the true flavor of foreign geneva cannot be imparted to spirit by juniper alone, and that the English gin of the present day depends for its flavor on no such substance. The following formulæ are merely given as specimens; and it is proper to remark, that every distiller has his own receipt for this notorious beverage. Hence it is that the gins of no two distillers are of precisely the same flavor; and this difference is still more marked when the distillers reside in parts of the country remote from each other. Booth's, Smith's, Nicholson's, Swan's, gins, etc., have each a characteristic flavor, readily perceived by their respective votaries. These variations in flavor generally depend on the use of

more or less flavoring matter, or of a spirit more or less clean or free from taint; and less frequently on the addition of a small quantity of some peculiar aromatic, which exercises a modifying influence on the chief flavoring ingredient. In many cases the flavor has originated from accident, but the consumers having become accustomed to, and hence relishing, that particular "palate," it is found to be unwise or commercially impossible to alter it. Any change in these matters is therefore looked upon in every distillery as a dangerous innovation, which would prove more prejudicial to the prosperity of its exchequer than the repeal of the duty on French wines and brandy, or even a frightful conflagration. The distillers, like the brewers, are thorough conservatives in all matters connected with the flavor of their liquors.

Preparation: (1) Clean corn spirit, at proof, 80 galls.; newly rectified oil of turpentine, 1¼ pint; mix well by violent agitation, add culinary salt, 14 lbs., dissolved in water, 40 galls.; again well agitate, and distil over 100 galls., or until the faints begin to rise. *Product*, 100 galls. of gin, 22 u. p., besides 2 galls. contained in the faints. If 100 galls. at 17 u. p. are required, 85 galls. of proof spirit, or its equivalent at any other strength, must be employed. (2) Proof spirit (as above), 8 galls.; oil of turpentine, 1 fl. oz.; salt, 1½ lb., dissolved in water, 4 galls.; draw over 10 galls., as before, 22 u. p. (3) Clean corn spirit, 80 galls.; oil of turpentine, 1 pint; pure oil of juniper, 3 fl. oz; salt 21 lbs.; water, 35 galls.; draw over 100 galls., as before, 22 u. p. (4) To the last, before distillation, add, of oil of caraway, ½ fl. oz.; oil of sweet fennel, ¼ fl. oz.; cardamoms (ground), 8 oz. (5) To No. 3 add, of essential oil of almonds, 1 dr.; essence of lemon, 4 dr. (6) To No. 1, before distillation, add of creosote 3 fl. dr. (7) To No. 3 add of creosote, 2 dr. (8) Proof spirit, 80 galls.; oil of turpentine, ¾ pint; oil of juniper, ¼ pint; creosote, 2 dr.; oranges and lemons, sliced, of each 9 in no.; macerate for a week, and distil 100 galls., 22 u. p.

In the preparation of gin, both sweetened and unsweetened, and indeed of liquors generally, the greatest possible care must be taken to avoid an excess of flavoring. The most esteemed samples are those that consist of very pure spirit, slightly flavored. The oil of turpentine used in this manuf. should be of the best quality, and not that usually vended for painting, which always contains resin and often fixed oil. Juniper berries, bitter almonds, and the aromatic seeds may be used instead of the essential oils; but the latter are the most convenient. Turpentine conveys a plain gin flavor; juniper berries or oil gives a Hollands flavor; creosote imparts a certain degree of smokiness, or whiskey flavor; lemon and the other aromatics a creaminess, fulness, and richness. The flavor imparted by cardamoms, when used judiciously, is peculiarly agreeable and appropriate. That from caraways is also in general esteem. Cassia in extremely small proportions also tells well. Fusel oil gives a whiskey-gin flavor; and in conjunction with creosote or crude pyroligneous acid a full whiskey flavor. The only danger in the employment of all these articles is using too much of them. When this misfortune happens, the remedy is to add sufficient plain spirit to reduce the flavor to the proper standard. The creaminess and smoothness so much admired in Hollands results chiefly from age. The English rectifier endeavors to imitate this by the addition of a little sugar. A rich mellowness, that combines well with gins turning on the "Hollands flavor," is given by a very small quantity of garlic, and with Canadian balsam or Strasburg turpentine. The peculiar piquancy, or the property of "biting the palate," regarded as a proof of strength and quality by the ignorant gin-drinker, is imparted to the liquor by the addition of a little caustic potassa. Sliced horse-radish gives piquancy as well as mellowness. Grains of paradise, cayenne-pepper, and sulphate of zinc are also commonly added by fraudulent dealers. — Although gin is always prepared on the large scale by distillation, it may also be made by the simple solution or digestion of the flavoring ingredients in the spirit; but it is, of course, better for distillation. If made in the former way, no salt must be employed. The gin produced by the above formulæ is that denominated in the trade *unsweetened gin, grog gin*, etc.; but much of the gin sold in the bars is a sweetened spirit, and hence is technically distinguished by the terms *sweetened*, or *made up*. To ascertain whether gin is sweetened or not, a little may be evaporated in a spoon, over a hot coal or a candle, when, if it is pure, it will leave the spoon scarcely soiled; but if, on the contrary, it has been sweetened, a small quantity of syrupy liquid, or sugar, will be obtained, the sweetness of which may be easily recognized by tasting it. — The whole of the casks and utensils employed for gin should be perfectly clean, and properly prepared, so as not to give color; as, if this spirit acquires the palest colored tint, its value is lessened, and if much colored it is rendered unsalable. When gin has once become much stained, the only remedy is to re-distil it; when it is only slightly stained, the addition of a few lbs. of acetic acid to a pipe or butt, a spoonful or two to a gallon, or a few drops to a decanterful, will usually decolor it, either at once or as soon as it is mixed with water to make grog.

Sweetened gin, Gin cordial. Good gin (22 u. p.), 90 galls.; oil of almonds, 1 dr.; oils of cassia, nutmeg, and lemon, of each 2 dr.; oils of juniper, caraway, and coriander, of each 3 dr.; essences of orris-root and cardamoms, of each 5 fl. oz.; orange-flower water, 3 pints; lump sugar, 56 to 60 lbs.; dissolved in water, 4 galls. The essences are dissolved in two quarts spirit of wine, and added gradually to the gin until the requisite flavor is produced, when the sugar (dissolved) is mixed in, along with a sufficient quantity of soft water, holding 4 oz. of alum in solution, to make up 100 galls. When the whole is perfectly mixed, 2 oz. of salt of tartar, dissolved in 2 or 3 quarts of hot water, are added, and the liquor is again well rummaged up; after which the cask is bunged up, and allowed to repose. In a week, or less, it will have become brilliant, and may be either "racked," or drawn from the same cask. *Product*, 100 galls., about 30 u. p.

Imp. duty, as alcohol.

Ginger [Fr. *gingembre:* Ger. *Ingwer;* It. *zenzero;* Port. *gengivre;* Sp. *jingibre*], the root of a plant (*Amomum zingiber*) cultivated throughout both the East and West Indies and China, and used as a spice. It occurs in knotty branched pieces, having a pleasant aromatic odor and biting taste. There are two varieties, the black and the white. *Black G.* consists of the inferior roots, which have been immersed in boiling water previously to being dried, and has thus a horny texture. *White G.* consists of the fairest and roundest roots, peeled when fresh, and dried in the sun. It is firm and resinous, more pungent than the black, and generally one third dearer. The roots which are worm-eaten, light or soft, and very fibrous, are to be rejected. *Preserved G.*, as manufactured in Europe, is dark and fibrous; but when prepared in the East or West Indies or China, from the young roots, it is almost transparent. It is imported in jars, and should be chosen in large pieces of a bright yellow color.

Imp. duty: the green, fresh, or dried root, free. — Ground, 3 cts. per lb. — Preserved or pickled, 35 per cent. — Essence of, 35 per cent.

Ginger-Beer, a popular effervescing, bottled drink, flavored with sugar.

Manuf. Take of white sugar 20 pounds, lemon or lime juice 18 fluid ounces, honey 1 pound, bruised ginger 22 ounces, water 18 gallons. Boil the ginger for half an hour in three gallons of the water, then add the sugar, the juice, and the honey, with the remainder of the water, and strain the whole through a cloth; when cold, stir in the white of one egg and half an ounce of essence of lemon; after standing four days, bottle. The bottles are to be laid on their sides in a cellar; and the beer is ready for use in about 3 weeks. If a little yeast be used, the beer is ready in two or three days, but in that case does not keep well.

G.-B. powder. Take of white sugar two drachms, bicarbonate of soda 26 grains, powdered ginger 5 grains, essence of lemon 1 drop; mix and put up in a white paper. In a blue paper put up half a drachm (30 grains) of finely powdered tartaric acid. When used, mix the powders and stir them into half a pint of water.

Gingerbread, a baked cake made of flour, treacle, and butter, with ginger and other spice, which will keep for some time.

Ginger-Grass (Oil of). See GERANIUM.

Ginger-Wine, a popular and cheap liquor, made by the fermentation of sugar and water, and flavored with various substances, but chiefly with ginger. It is partly an article of domestic manufacture, and is partly made on a larger scale for sale.

Gingham, BENGAL STRIPS, a cotton cloth generally bearing a colored check pattern, which is not produced by dyeing or stamping the manufactured material, but by interweaving colored threads. The various kinds of *G.* now manufactured are known by different names in commerce;

and umbrella *G.* is woven with threads all of the same color.

Ginning, the operation of cleaning cotton-wool from the seeds, by an apparatus called a gin. See COTTON.

Ginseng, the root of the *Panax schinseng*, which was formerly regarded in China as a panacea for nearly all diseases, and realized an enormous price in consequence. It is still highly esteemed there, but American and English practitioners look upon it as a comparatively inert substance. An allied species, *Panax quinquefolium*, grows wild in the northern, middle, and western States, and the roots, which are two or three inches long and about as thick as the little finger, are collected and brought to the seaboard cities, particularly to Philadelphia, from whence they are exported to China.

Gipsy-Winch is a small winch having a drum, ratchet, and pawl, and attachable to a post.

Girandole, a branch burner or chandelier for gas. — A stand for candles or flowers.

Girard, a fire and marine insurance Co., located in Philadelphia, Pa., organized in 1853. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, \$300,000; net surplus, \$527,840.51; risks in force, \$40,923,244; premiums, \$488,291.62; premiums received since the organization of the Co., \$4,650,897.80; losses paid, \$1,957,147.32; cash dividends paid to stockholders, \$583,331.

Girders, beams of wood or iron for supporting the superincumbent weight in any erection, as in houses, bridges, etc.

Girdle, a belt. — A circular plate of malleable or cast iron, used in Scotland for toasting cakes over a fire. — The point of greatest marginal circumference of a brilliant-cut diamond, at which it is grasped by the *setting*.

Giro [Ger.], endorsing. There are Giro banks at Frankfort, Hamburg, etc., which transact this species of business.

Girth, the circumference or round measurement of timber, etc — The belly-strap for a saddle.

Git, in founding, the entrance for molten metal into a mould.

Glace, the French word for looking-glass, and also for ice.

Glace-Cotton, cotton threads or yarn twisted, gummed, and highly finished, used as warps for velvets, trimmings, etc., made in Leicestershire, England; also glace sewing-cotton.

Glace-Silk, a kind of shaded silk for ladies' dresses.

Glaire, the white of eggs, used as a size in book-gilding.

Glance, a term for certain minerals which have a metallic lustre, as *glance coal* (for which see ANTHRACITE).

Glance-Wood, a hard wood imported from Cuba, and used for making carpenters' rules, gauging instruments, etc.

Gland, the cover of the stuffing-box of a steam-engine. — Also generally applied in the sense of a joint holding lubricating fluid, with tight packing.

Glareous, viscid and transparent, like the white of an egg.

Glasgow. See GREAT BRITAIN.

Glass [Fr. *verre;* Ger. *Glas;* It. *vetro;* Sp. *vidrio*]. The general term *glass* is employed by chemists to denote all mineral substances which, on the application of heat, pass through a state of fusion into hard and brittle masses, and which, though not always transparent, exhibit a lustrous fracture when broken. The *G.* of commerce, however, to which our remarks are restricted, or the transparent and artificial substance which is usually distinguished by the generic name, is produced by the igneous fusion of siliceous earth with certain alkaline earths or salts, or with metallic oxides. In its usual form it is brittle, transparent, non-crystalline, insoluble, and fusible; but it sometimes exhibits other properties.

In the most remote ages the art of blowing *G.* into bottles, making it into vases, coloring it to imitate precious stones, melting it into enormous masses to make pillars, rolling and polishing it into mirrors, and tinting it into parts, were all perfectly well known. For its origin we must look to Egypt (Fig. 233), the parent of so many collateral arts. Some authors ascribe, with very plausible reason, the discovery of *G.*-making to the priests of Vulcan at Thebes and Memphis, the greatest chemists in the ancient world. The Egyptians are also known to have made enamels of divers colors which they applied on pottery, magnificent specimens of which are still extant, and

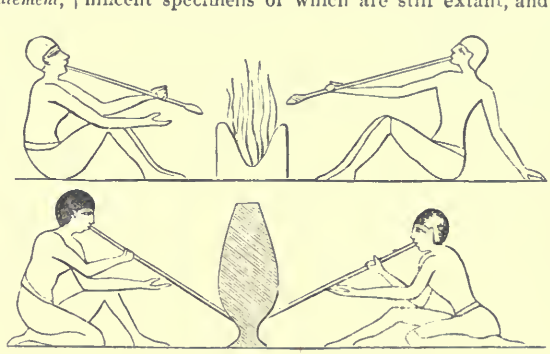


Fig. 233. — EGYPTIAN GLASS-BLOWERS.
(From the Tombs at Thebes.)

are called Egyptian porcelain. These are chiefly covered with beautiful blue or green, and groups of flowers or designs are traced in black. *G.* beads, and other ornaments made of that substance, skilfully manufactured and beautifully colored, have been found adorning mummies which are known to be upward of 3,000 years old. It is certain that Tyre, Sidon, and Alexandria were long celebrated for their *G.*, and furnished the greater proportion of that used at Rome. To these places the art was exclusively confined for some centuries, and was an article of luxury, being chiefly in the form of urns or drinking-cups of the most elaborate workmanship, and exquisitely embellished with raised, chased, or ornamented figures. The Barberini or Portland vase, composed of deep blue glass, with figures of a delicate white opaque substance raised in relief, is a splendid specimen, and was found in the tomb of Alexander Severus, who died A.D. 285. The precise period at which the making of window-*G.* came into practice is not certainly known. The Roman windows were filled with a semi-transparent substance called *lapis specularis*, a fossil of the class of mica, which readily splits into thin, smooth laminæ or plates. The Romans were chiefly supplied with this article from the island of Cyprus, where it abounds. There is no positive mention of the use of *G.* for windows before the close of the 3d century. *G.* windows are distinctly mentioned by St. Jerome as being used in his time (A.D. 422). After this period we meet with frequent mention of them. It is asserted

that *G.* windows were first introduced into England in the year 674, by the Abbot Benedict, who brought over artificers skilled in the art of making window-*G.*, to glaze the church and monastery of Wearmouth. The use of window-*G.*, however, was then, and for many centuries afterward, confined entirely to buildings appropriated to religious purposes; but in the 14th century it was so much in demand, though still confined to sacred edifices and ornamental purposes, that glazing had become a regular trade. Until this period they were rarely to be found in private houses, and were deemed a great luxury, and a token of great magnificence. The windows of the houses were till then filled with oiled paper or wooden lattices. The *G.* of the Venetians was superior to any made elsewhere, and for many years commanded the market of nearly all Europe. The skill of the Venetians was especially remarkable in the excellence of their mirrors. The art of *G.*-making seems to have been introduced in France in the 13th century, and in England a century later. The manufacture of *G.* was introduced into the American States in 1790 by Robert Hewes, a citizen of Boston, who erected a factory in the then forest of New Hampshire. The chief aim of Mr. Hewes was to supply window-*G.*, but he did not succeed. Another attempt was made in 1800, when a factory was built in Boston for making crown window-*G.*; but this was also unsuccessful, till a German named Lint, in 1803, took charge of the works, and the State of Massachusetts agreed to pay the proprietors a bounty on every table of window-*G.* they made; after which the manufacture was carried on successfully, the *G.* steadily improving in quality, and becoming famed through all the States as Boston window-*G.* Above 50 companies have been since formed in the Eastern States, most of which have proved failures. There are now important manufactories of *G.* at Boston, Cambridge, Sandwich, New York, Philadelphia, Pittsburg, etc.; but this industry does not seem to be yet fully naturalized in this country, and we continue to pay yearly to Europe a heavy tribute for our supply of *G.* of every description. The total value of *G.* imported into the U. States, for the year 1878, was $3,335,149. Window-*G.* comes principally from Belgium; plate-*G.* and *G.*-ware from Germany, England, France, and Belgium.

Manuf. The manufacture of *G.* is one of the highest beauty, and, considering the comparative worthlessness of the materials of which it is made, and the various purposes of a useful, ornamental, and scientific nature which it subserves, it may be regarded as perhaps the most important in the history of inventions. The principle of its production is very simple,

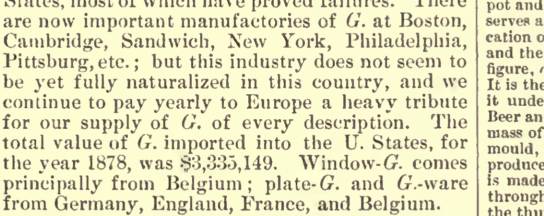


Fig. 234. — Glass-Furnace.

although great skill and experience are necessary to insure its excellence. Silica (commonly under the form of sand) is heated with carbonate of potassa or of soda, and slaked lime or oxide of lead, until the mixture fuses, and combination takes place. After a time the melted mass becomes perfectly limpid and free from air-bubbles, when it is allowed to cool until it assumes the peculiar tenacious condition proper for working. The operation of fusion is conducted in a furnace (Fig. 234), circular in form, and of sufficient size to admit 8 or 12 large melting-pots. Doors in the wall of the furnace give access to these pots, and the low-domed roof causes the heat to be reflected down upon them. These pots are made of well-prepared and well-annealed clay; some of them are 3 feet wide, 4 feet high, weigh 10 cwt., and will contain 16 to 20 cwt. of glass. They are closed on all sides, except a projecting mouth near the top

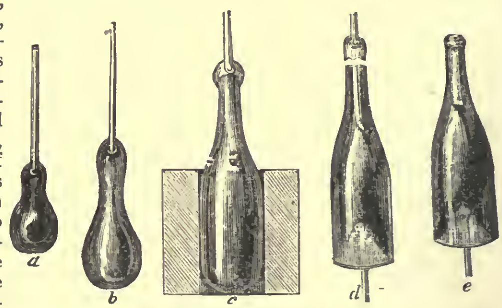


Fig. 235. — Bottle-Making.

of one side. The *frit* (the name given to the powder into which the constituents of *G.* are reduced before melting) is thrown into the pots through the furnace doors; the doors are closed; the heat is urged to the highest point; and then the frit, melted into a golden liquid *G.*, is ready for use. — The chief kinds of *G.* are *Bottle-G.*, *Crown-G.*, *Flint-G.*, *Optical G.*, *Plate-G.*, *Sheet-G.*, and *Stained G.*, here noticed in their alphabetical order.

Bottle G. The mixture for common bottles is as follows: yellow sand 20, kelp 8, lixiviated wood-ashes 30, fresh wood-ashes 8, pale clay 16, *cullet* (broken *G.*) 18 = 100. Bottles are made by blowing and rolling. The workman begins by collecting a proper quantity of *G.* in a soft, pasty state, at the end of his blowpipe (an iron tube, five or six feet in length, terminated by a mouthpiece of wood), which he then commences blowing through, by which the lump is expanded (Fig. 235) into a kind of flask, *a*, *b*, susceptible of having its form modified by the position in which it is held, and the velocity of rotation continually given to the iron tube. The bottle is then introduced in a mould, *c*, when it is blown to the wanted size. Then an iron rod, called a *pontil*, is dipped into the *G.*-pot and applied to the bottom of the flask, to which it thus serves as a handle, the blowpipe being removed by the application of a cold iron to the neck. The bottle is now re-heated, and the aperture finished, and the vessel otherwise altered in figure, *d*, *e*, by the aid of a few simple tools until completed. It is then detached, and carried to the *annealing oven*, where it undergoes slow and gradual cooling during many hours. Beer and wine bottles are now generally made as follows: The mass of molten *G.* at the end of the tube is inserted in an iron mould, which gives the external form, while the hollowness is produced by blowing through the tube. To make *carboys*, use is made of steam produced by spirting a mouthful of water through the blowing-tube, the end of the tube being covered by the thumb.

Crown-G. is the best kind of window-*G.* The hardest and most colorless is a mixture of silica 63, potash 22, alumina 3 = 100. It is harder than flint-*G.*

Bohemian G., in its composition, is similar to the above in respect to the absence of lead in notable quantities. It is a silicate of potash and lime, with a little silicate of alumina. It is very hard, transparent, and difficult to fuse. — Crown-*G.* is made in round disks by the following process: The materials are fritted in a reverberatory furnace, and then melted in a pot. A lump of *G.* sufficient to make a *table* of nine pounds weight is extracted at the end of a *blowing-tube*, and is distended into a pear-shape by blowing through the tube and rolling on the *marver*, which is a cast-iron slab on a stand. Being softened by heat at the mouth of a small blowing-furnace, it is rolled on the marver, and blown till it assumes a more spherical shape, but has a conical end, which is removed as the *G.* approximates a spherical form, being blown as it is rolled on the *bullion-bar*. Being again heated at the blowing-furnace, rotation and blowing being persevered in, it becomes spherical. It is then presented at a larger furnace-hole, called the *bottoming-hole*, and, being rapidly rotated, becomes oblate. A pontil tipped with molten *G.* is then applied to the centre of the flat portion, and the blowing-tube is detached by touching the neck of the globe with a cold wet iron. This leaves a hole in the end from which the blowing-tube was detached. Heat and rotation being still applied, first at a furnace-opening of moderate size called the *nose-hole*, and then at a much larger one called a *flashing-furnace*, the hole becomes more and more enlarged as the article becomes more and more oblate. Finally it flies open with

a sharp, rustling noise, and appears as a flat plate, called a *table*, adhering at its central, thicker portion, the *bull's-eye*, to the pontil, by which, during the later portions of the process, it was rested on the hook in the half-wall before the furnace, which formed a partial screen for the workman. When it has cooled sufficiently to be rigid, and not liable to bend or collapse, it is placed on a fork, the pontil detached by the application of a cold iron, and the table placed in the annealing arch or kiln, where it rests on its edge for perhaps twenty-four hours, gradually cooling. — *Knight's Am. Mechanical Dict.*

Cylinder G. See *sheet-G.*, below.

Flint-G. consists of silica 52, potash 22, alumina 1, oxide of lead 32, oxide of iron $2 = 100$. By dexterous handling, the blower takes up by the blowing-tube just as much *G.* as will make the decanter, claret-jug, goblet, wineglass, or whatever article is to be made. The *G.*, which has a consistence somewhere between paste and putty, is rolled a little on a marver (see *crown-G.*); it is expanded by blowing through the tube; it is gently touched here and there with wooden and iron tools; it is kept rotating to prevent it from falling off the end of the tube; and in a way which is scarcely conceivable even to a by-stander, it assumes the form of a shapely article. The *G.* requires then to be *annealed*. It must be cooled slowly, otherwise the substance will be brittle; and the mode of effecting this cooling constitutes the annealing. The annealing oven is called a *leer*, or *lear*; it is a very long narrow arch, kept highly heated at one end, and gradually colder and colder towards the other. The articles in *G.*, placed upon iron trays, are pushed into the heated end of the oven: others are pushed in after them as fast as made; each tray reaches a slightly cooler region at each movement; and after many hours the fragile products are removed quite cold from the remote end of the leer. Other plans are occasionally adopted; but this is the usual mode of annealing.

Optical G. The *G.* required by the makers of high-class telescopes, microscopes, prisms, etc., is the best which art can produce; seeing that any flaw, streak, or spot becomes magnified as a defect in the using of the instrument. Scrupulous choice of ingredients, and delicate processes of making, are indispensable. If the ingredients are not well mixed and diffused, the glass will have a higher optical power at one part than at another; if any of the grains of sand or flint are imperfectly fused, they produce spots; if one side of the melting-pot be hotter than another, the *G.* will be unequal in quality; if the cooling be either too quick or too slow, irregularities of other kinds arise. Hence a piece of really perfect *G.*, large enough to make the object-lens for an equatorial telescope, or a transit instrument, is valued very highly. *G.* for ordinary instruments, with 10 per cent increase of oxide of lead, is, after careful mixing and melting, blown into cylinders, which are cut open into slabs about 14 inches by 10, and half an inch or so in thickness: the optician cuts off pieces from this slab to grind into lenses of the sizes needed. A very perfect, but not very durable, optical *G.* is made of a combined silicate and borate of lead, according to a plan suggested by Dollond, Herschel, Faraday, and Roget. Numerous researches have been made by Guinand, Fraunhöfer, Merz, Bontemps, Daguet, and Chance to produce optical *G.* of high quality. Disks of large size have been displayed at the various international exhibitions, some as large as 29 inches diameter, with results so far satisfactory as to encourage further experiments. It may here be mentioned that, as the object-glasses of achromatic telescopes are made by a combination of flint-*G.* and crown-*G.* lenses, those two kinds of *G.* must be equally studied to attain good results.

Plate-G. This is in some respects the most beautiful of all kinds of *G.*, on account of its transparency, colorlessness, high polish, absolute flatness, and facility of being silvered. It consists of silica 78, potash 2, soda 13, lime 5, alumina $2 = 100$. The manufacture differs in many important particulars from that of other kinds of *G.*, as the following brief account will show: The melting-pots are very large, some of them holding as much as 30 cwt. of *G.* When the molten mass is ready for use, a large copper ladle, held by a long handle, is employed to lade it out from the melting-pots into other pots called *cisterns*, where it is allowed to fine or refine by settling, and to lower somewhat in temperature. The *casting-table* then comes into use. This is made of iron, brass, or bronze, and is always as perfect a slab as the art of the metallurgist can produce, — beautifully even, flat, and smooth, sometimes as much as 20 feet long by 11 broad, and 7 inches thick. There is a framework round this slab which facilitates the operations. Huge tongs take the cistern out of the furnace; a crane lifts it up, and places it in a peculiar position over one end of the table; the slab is heated to a certain temperature; the cistern is tilted up, and the golden stream flows all over the table, being prevented by raised edges from running over. A large copper cylinder then rolls to and fro, bringing the molten *G.* to a uniform level and thickness. When sufficiently solidified to be moved, the immense sheet of *G.* is pushed end on into an annealing oven, which is built close to it. When the *G.* is annealed it is ready for *grinding*, to give smoothness to surfaces which are as yet somewhat rough. This is done by rubbing one *G.* upon another, the upper *G.* being temporarily fixed to a frame which has peculiar gyratory movements given to it by steam-power. Sand of three different degrees of fineness and water are used to assist this grinding. The *G.* was half an inch thick in the first instance; but the grinding repeated in succession on both surfaces greatly reduces the substance. The *G.* is now smooth but dull; it still wants *polishing*. This is done, first by emery and water, and then by felt rubbers, applied in various ways. Sometimes plate-*G.* is made by the cylinder method, described below under *sheet-G.*, followed by the grinding and polishing processes. See MIRROR.

Sheet-G. (also called Cylinder, Broad, Spread, German *G.*) is a mode of manufacturing which is as remarkable in its way as that of crown-*G.* The workman collects a quantity of molten *G.* on the end of his blowing-tube, rolls it on an iron

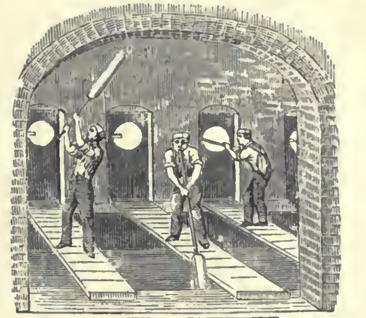


Fig. 236. — BLOWING SHEET-GLASS.

slab, blows through the tube, reheats the mass of *G.*, keeps the tube rotating on its axis, and so continues until the *G.* extends as a sort of irregular, bottle-shaped globe beyond the lower end of the tube (Fig. 236). Then swinging the rod several times in a great vertical circle, the *G.* elongates into a sort of sugar-loaf, with the broad end attached to the tube. The apex of the sugar-loaf bursts open, and there is then produced an open cylinder, attached in a surprising way by its closed end to the tube. All this time the *G.* is in a glowing state; and the alternate rolling, rotating, blowing, and swinging are continued until the substance assumes a solid consistency, although still quite hot. By the aid of a few tools the cylinder is brought to a true shape while still somewhat soft; by a touch with a wetted iron rod it is separated from the tube; by a line drawn with another wetted rod it is split open from end to end, ready to be spread out as a flat quadrangular sheet. The cylinder is transferred to the *flatting-furnace*, with the slit uppermost; the heat causes it to open, and a workman flattens it out with a wooden polisher moistened with water. However carefully this process may be conducted, there is always a *waviness* in the *G.* which detracts from its otherwise useful qualities in glazing prints and drawings. Sheet *G.* is especially useful in glazing large structures, such as exhibition buildings, railroad stations, etc.

Stained G. differs materially from *painted G.*, although the terms are frequently used synonymously. In stained *G.* the substance of the *G.* itself has been colored throughout in the process of manufacture, while in painted *G.* the *G.* is only painted on the surface. Real stained *G.* is simply *colored G.*, and the color is almost always given by adding certain metallic oxides to the other ingredients. Many ancient nations were acquainted with modes of making colored *G.*; but it is not certain what kind of chemical agents they employed. Oxides of gold tend to produce red tints: those of copper tend towards green; those of manganese purple; and so on with other oxides and chlorides. The *G.*-stainer ought, therefore, to possess a good knowledge of the chemistry of colors. *G.* colored throughout the mass is called *pot-metal*; and it is called *flashed G.* when the colored material is put on as a superficial coating. When *G.* is to be stained throughout, the coloring ingredient is mixed with the sand, alkali, and other ingredients in the *G.*-pot, and melted all together; or else good white transparent *G.* is remelted, and the metallic oxides combined with it in that state. When it is to be stained on one surface only, the *G.*-blower has two pots in the furnace, one with transparent and the other with colored *G.* He dips his blowing-tube into the former, and takes up the requisite quantity of *G.*; after rolling and settling it a little, he dips it for a moment into the colored *G.*, of which he takes up a thin film. The blowing and finishing are then proceeded with, leading to the production of *G.* with a thin colored film on a white foundation. See WINDOW-*G.*, CROWN-*G.*, SHEET-*G.*, and *G.*-PAINTING.

Glass Tubes are made by rapidly drawing out a hollow cylinder; and from these a great variety of useful small apparatus are constructed with the help of a lamp and blowpipe, or, still better, the bellows-table of the barometer-maker. *G. beads* are made from small tubes chopped into pieces of suitable lengths, which are stirred first in a mixture of sand and wood-

ashes, in the cold, and afterwards in an iron pan over the fire until they assume a rounded form. *Small tubes* are bent in the flame of a spirit-lamp or gas-jet, and cut by a file, a scratch being made, and the two portions pulled or broken

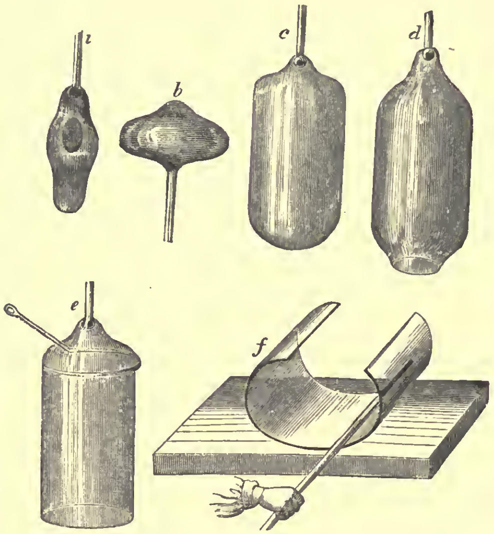


Fig. 237. — Different Stages in Sheet-Glass Making.

asunder in a way easily learned by a few trials. *Large tubes* require the heat of a powerful blowpipe and lamp, or that of a furnace.

Cutting G. The kind of *G.* mostly used for ornamental cutting is flint-*G.* It is cut by means of wheels, of different sizes and materials, turned by a treadle, as in a common lathe; some are made of fine sandstone, some of iron, others of tin or copper; the edges of some are square, some are round, and some are sharp. They are used with sand and water, or emery and water, but stone wheels are used with water only. The *G.*-cutter also uses rods of copper, with knobs at their ends, for making round indentations; these turn on their axis, so that the end cuts a round hollow in the glass. The work is at first cut roughly, afterwards smoothed off with the sandstone or tin wheel, — the latter has to be smeared with emery and water, — and finally polished by a wooden wheel, with finely powdered pumice-stone applied to its edge, and moistened with water. The glass for spectacles and optical instruments is cut by concave or convex moulds of brass, moistened with emery and water, and polished by means of a mould of pitch, wetted with crocus and water.

Grinding G. This on the large scale, like *G.*-cutting, forms a distinct occupation. Great art and accuracy are required to grind the glasses for optical instruments, especially very large or very small ones, as for microscopes, the various "powers" of which constitute their chief expense, — one the sixteenth of an inch in diameter costing about $60. On the small scale, *G.* may be roughened or ground by friction with powdered emery and water and a flat rubber of wood, care being taken that the article, if a plate, is laid on a perfectly flat surface, or, if hollow, is supported by a core of cement or plaster.

Gilding of G. Gold chloride is dissolved in boiling water; the solution is filtered, and the filtrate so far diluted, that 200 cubic centimètres contain 0.0648 gram of the metal, and it is then made alkaline with soda. The reducing agent is alcohol saturated with marsh gas; this is diluted with its own volume of water. 25 cubic centimètres of this solution are mixed with the alkaline gold chloride solution, and this mixture is poured between the perfectly well-cleaned plate to be gilded, and another sheet of glass placed at a distance of 3 mm. under the first. After two to three hours' rest the gilding is effected.

Toughened G. [Fr. *verre trempé.*] M. de la Bastie's process for converting ordinary into toughened, tempered, or hardened *G.*, may in general terms be said to consist in heating the *G.* to a certain temperature, and then plunging it into an oleaginous bath. For the process, however, to be successful, the observance of a number of minute details is essential; if these be neglected, failure is certain to ensue. Thus it is found, that if the *G.* be insufficiently heated it will, when immersed in the bath, fail to be affected by it, and will consequently experience no alteration in properties. Again, if overheated, it will then get out of shape; or, further, it may be heated to the right temperature, and yet be spoilt as it is being transferred to the bath. Moreover, the exact composition of the bath itself, and its temperature, constitute very important conditions, the most trifling departure from which may give rise to unsatisfactory results. All these obstacles appear to have been overcome by M. de la Bastie, who has designed plant in the shape of furnaces and baths, by means of which the tempering process can be carried out, without chance of failure. When the *G.* is brought to the required temperature, all that is necessary is that it should be plunged into the bath, and instantly withdrawn. The cost of the operation is stated to be very small. The process as carried out at New York is thus described: The *G.*, after being run from the furnaces and moulded as usual, instead of being put into annealing pans, is immersed in a hot bath consisting of three parts of flaxseed oil and one part of tallow. The bath stands at about 320°; and after remaining in this the ware is removed to a second and similar bath, by which it is cooled down to about 200°. Finally the pieces are immersed in a water bath, and then dipped into a quantity of ordinary refined burning oil. They are then cleaned, ready for packing, with plaster of Paris powder. This new process has been very much employed in the manuf. of lamp-chimneys, but the results so far obtained are variable. In some cases the articles subjected to it possess great toughness, and the *G.* bears a blow without experiencing any fracture. In other instances, however, a slight fall or blow shivers it to atoms. When the toughened glass under any circumstances breaks, it possesses a disadvantage over ordinary broken glass, in distributing itself into a great number of small, sharply angular fragments. Another process for toughening *G.*, which has been patented by Herr F. Siemens, consists in heating, and then pressing, and suddenly cooling the *G.* to be hardened; but when the articles are such as are usually moulded, the hardening and tempering are accomplished at the same time as the pressing; thus the molten glass is run into suitable moulds, and while still highly heated is squeezed, the moulds effecting the necessary cooling, — a proceeding which renders the employment of the oleaginous bath unnecessary. Mr. Bauer's method for toughening *G.* consists in heating ordinary *G.* plates so strongly that they begin to bend from softening, and then plunging them into a liquid paraffin bath having a temperature of 200°. — Toughened *G.* is liable to rupture under circumstances that have not yet been accounted for.

Soluble G. When 8 parts of dry carbonate of soda, or 10 parts of carbonate of potash, are fused with 15 parts of pure quartz, a glass is obtained which is soluble in 6 parts of boiling water. It has been used to diminish the combustibility of wood and woven fabrics, especially of theatrical scenery; as a varnish to preserve some building stones; in fresco-painting, and in the place of rosin in the manufacture of soap.

Import Duties.

Glass, broken, fit for re-manufacture only, free.
" manufactures of, not otherwise provided, 40 per cent.
" plain, moulded, and pressed, 35 per cent.
" cut, engraved, colored (printed, stained, silvered, or gilded), 40 per cent.
" bottles or jars filled with sweetmeats or preserves, 40 per cent.
" crystals for watches, 40 per cent.
" plates or disks, unwrought, for optical instruments, 10 per cent.
" porcelain, or Bohemian glass, 40 per cent.
" window, rough plate, fluted, rolled, not above 10 by 15 in. ¾ ct. per sq. ft.
" above 10 by 15 in., not above 16 by 24 in., 1 ct. per sq. ft.
" above 16 by 24 in., not above 24 by 30 in., 1½ cts. per sq. ft.
" above 24 by 30 in., not above 24 by 60 in., 2 cts. per sq. ft.
" window, unpolished cylinder, crown, and common, not above 10 by 15 in., 1½ cts. per sq. ft.
" above 10 by 15 in., not above 16 by 24 in., 2 cts. per sq. ft.
" above 16 by 24 in., not above 24 by 30 in., 2½ cts. per sq. ft.
" above 24 by 30 in., not above 24 by 60 in., 3 cts. per sq. ft.
" window, polished cylinder and crown, not above 10 by 15 in., 2½ cts per sq. ft.
" above 10 by 15 in., not above 16 by 24 in. 4 cts. per sq. ft.
" above 16 by 24 in., not above 24 by 30 in., 6 cts. per sq. ft.
" above 24 by 30 in., not above 24 by 60 in., 20 cts. per sq. ft.
" above 24 by 60 in., 40 cts. per sq. ft.
" window, cast or polished, not silvered, not above 10 by 15 in., 3 cts. per sq. ft.
" above 10 by 15 in., not above 16 by 24 in., 5 cts. per sq. ft.
" above 16 by 24 in., not above 24 by 30 in., 8 cts. per sq. ft.
" above 24 by 30 in., not above 24 by 60 in., 25 cts. per sq. ft.

Glass, window, cast or polished, not silvered, above 24 by 60 in., 50 cts. per sq. ft.
" window, cast or polished, silvered, and looking-glass plates, not above 10 by 15 in., 4 cts per sq. ft.
" above 10 by 15 in., not above 16 by 24 in., 6 cts. per sq. ft.
" above 16 by 24 in., not above 24 by 30 in., 10 cts. per. sq. ft.
" above 24 by 30 in., not above 24 by 60 in., 35 cts. per sq. ft.
" above 24 by 60 in., 60 cts. per sq. ft.

Glass-Cloth. See this word in the Appendix.

Glass-Engraving. See ENGRAVING.

Glasses, spectacles for assisting the sight.

Glass-Painting, the art of painting designs upon glass, either stained or colorless, with substances consisting usually of metallic oxides combined with a vitreous vehicle. When subjected to a great heat the colors thus applied become permanently united with the surface of the glass. Byzantine Greeks appear to have been the first persons who practised painting upon glass, and from Byzantium the art passed into the West of Europe, by way of Venice and Marseilles. In France, the art of glass-painting was practised with great success during the 12th century. After that time painted-glass windows were regarded as essential in religious edifices of any pretension. Painted windows of the 13th century abound in France, Germany, and England, and belong to the First Pointed, or Early English style of architecture. The painted glass of the 14th century was more vivid in color, with greater breadth in style, and more careful painting, than that of the preceding century. It was, however, less pure in conception, and not so strictly subordinate to the architectural effects. In the glass-painting of the 15th century a great change took place. The windows became more individualized, and still less dependent upon the architecture. The designs were larger, and began to be treated as pictures. After the 15th century glass-painting declined more and more, and until within late years has never shown any symptoms of revival. The great seats of this art are now in Munich, Nuremberg, Paris, Birmingham, and Edinburgh.

The method by which glass-painting is now practised differs in different places; but the general plan is as follows, for a small work on a single plate of glass: A careful cartoon, the size of the painting, having been procured, the glass is laid on it, a tracing made from it, and the outline is carefully traced on the glass, with black or brown, composed of a very fusible vitreous flux, colored with a metallic oxide, and ground extremely fine in an essential oil. Those parts which are intended to be yellow, orange, or red are then coated according to the tint required, with a mixture composed of an alloy of silver and antimony, ground up with the red oxide which is obtained by subjecting sulphate of iron to a red heat. The glass is then exposed in a furnace to a red heat, in which the tracing color is fused, and adheres permanently to the glass. The mixture of silver and antimony colors the glass, but does not melt; so that the oxide of iron may be brushed off in the state of dry powder, leaving the glass colored, but transparent. The other tints, composed of very fusible glass, colored with metallic oxides, are then added, and the whole once more exposed to heat. In most cases, the glass is heated, or "fired," as it is called, between the application of each color. In making a painted window, many pieces of glass are fixed together in a leaden framework, great care being taken to arrange the several compartments from the cartoon.

Glass-Paper, pulverized glass fastened on paper with glue, similar to emery-paper, and used like it for abrasive purposes.

Glass-Staining. See GLASS.

Glass-Ware, the commercial name for manufactures of glass, embracing plain and cut glass articles, Bohemian glass, colored, painted, and ornamented glass, bottles, etc.

Glauber-Salts, sulphate of soda, a compact, massive, white mineral which effloresces rapidly, originally named after the discoverer, Glauber, a German chemist. It has a cooling, slightly bitter taste, and is a good purgative.

Glaucous, having a sea-green color.

Glaze, any coating or varnish applied to a surface to render it smooth and glassy; any factitious, shining exterior. In the porcelain and earthenware manufacture, the vitreous coating which is so essential to the beauty and utility of potter's ware. Glazes are either white or colored. The former, by the addition of the coloring ingredients used for enamels, are converted into the latter.

The best way to regard the glaze of porcelain and earthenware is as a true *glass* burnt into the surface of the ware. For coarse ware the *G.* usually contains oxide of lead; for fine ware, oxide of tin; for certain special kinds, earthy oxides. As the *G.* must not only render the ware impervious to water, but must be transparent, lustrous, and durable, its composition should bear some definite relation to that of the substance whereon it is applied; and this is attended to in practice. Metallic and earthy oxides, salt, potash, borax, baryta, phosphate of lime, silica, — all are used in some or other of the kinds of *G.* For special kinds of ware the *G.* is required to be either slightly opaque or slightly tinted; and the ingredients are selected accordingly. The chief materials in ordinary earthenware *G.* are salt and borax. The dry ingredients of the *G.* are ground to powder and mixed with water; and, in the majority of instances, the ware is simply dipped into this cold liquid. Pottery-glazing used to be an unhealthy employment when oxide of lead was much used; but borax is now substituted, producing a whiter, harder, and less injurious *G.* See PORCELAIN, POTTERY, etc.

Glazer, a wooden wheel for polishing knives, coated on the edge either with leather having a rough surface of emery-powder glued on, or with a ring of metal, consisting of an alloy of lead and tin. — A calenderer, or calico-smoother. — A workman who applies the vitreous incrustation to the surface of earthenware.

Glazier, a workman who sets panes of glass in sashes or window-frames.

Glazier's-Diamond, a cutting tool used by glaziers, consisting of a small diamond mounted in a handle.

Glazier's-Point, a small triangular piece of tin plate, used to secure a pane of glass in the sash previous to puttying.

Glazing, the operation of putting window-panes in frames. — The operation of applying a liquid glaze on earthen or porcelain wares, or other articles. — The imparting of gloss to woven fabrics, as in calendering. — The polishing of metals by means of small wheels or disks covered with some polishing substance.

Glengarry, a Scotch bonnet.

Glenlivet, a fine kind of Scotch Highland usquebaugh, or whiskey; named from the district in which it is made.

Glens Falls, an insurance Co., located in Glens Falls, N. Y., organized as a mutual fire-insurance Co., in 1850, under the name of the Dividend Mutual Insurance Co., changed to a joint-stock Co., under its present name, in 1864. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $414,931.86; risks in force, $57,411,334; premiums, $534,919.39; premiums received since the organization of the Co., $3,534,488.21; losses paid, $2,035,241.52; cash dividends paid to stockholders, $230,300.

Gleuconometer, an instrument used in France to test the strength of the juice of the grape when first pressed.

Globe, a ball. — A glass shade for lamps. — A receptacle for small fish in a room. — A sphere, on which is represented a map or delineation of the constellations and celestial bodies, or of the parts of the earth, showing the divisions of land and water, etc.

Globe, a fire-insurance Co., located in New York City, organized in 1863. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $127,116.16; risks in force, $16,838,090; premiums, $79,993.80; premiums received since the organization of the Co., $1,466,882.27; losses paid, $652,005.59; cash dividends paid to stockholders, $350,000.

Gloom-Stove, the drying-oven used in making gunpowder.

Glonoine-Oil. See NITRO-GLYCERINE.

Gloss, a lustre or varnish; a polished or shining surface.

Glossary, a vocabulary explaining antiquated, local, obscure, etc., words, or scientific names.

Glossing, an operation consisting in moistening silk thread with steam, and stretching it to develop a gloss.

Glossy, having a smooth, shining surface.

Glost-Fireman, **Glost-Placer**, a workman engaged in the potteries.

Gloucester Cheese. See CHEESE.

Glove [Fr. *gant;* Ger. *Handschuh;* It. *guanto;* Port. *luva;* Sp. *guante*], a well-known covering for the hand, made generally of leather, but frequently also of cotton, silk, worsted, and linen. Of the first, the finest are those made from the skin of the kid, which is valuable in proportion to its elasticity. Independent of the quality of the kid, a good *G.* is distinguished, first, by its being neatly sewed; secondly, by the thumb-seam not extending too far into the palm; and, lastly, by the color of the exterior not having soiled the inside. Most of the lower-priced *G.* offered as "kid" are in reality made of lamb-skin. When what is called kid *G.* feels unusually stout, it may be considered highly probable that it is only lamb-skin in imitation. It must consequently be understood that all good kid must be reasonably thin. The best skins are decidedly the French; next, the Italian; and, lastly, those from Ireland. *Doeskin*, though much inferior to kid, is a thick, durable, and soft leather. *Sheepskin* is chiefly used for cheap white *G.* *Buckskin* is the closest grained, and consequently the strongest leather of which *G.* are made. Its elasticity, though trifling, is sufficient. It also bears cleaning better than any other kind. It may be had in white, drab, or buff. *Tan* is of three qualities, common, drawn, and York. This is a very serviceable and cheap *G.* for gardening, riding, and driving. The strongest of each class is sewed peculiarly, and termed pricked seams. The quality of *silk G.* is determined by weight and neatness of sewing. They may be had in white, black, French white, and colors. *Thread G.* are made of hemp, and are neater in appearance, though much resembling those made of cotton. The best cotton *G.*, called *Berlin G.*, are largely manufactured in Saxony and Prussia. The silk, thread, and cotton *G.*, however, cannot be recommended, except on the score of economy. The kid *G.* of France continue to maintain their superiority over the kid *G.* of English or German make, but for inferior qualities Germany has been our principal importer. *G.* are now extensively manufactured at Gloversville, N. Y., also in New York City, Philadelphia, Massachusetts, and Connecticut. They are made of deerskins, imported goat and sheep skins, a kind of hog-skin from S. America, and of a kip-skin of India. Most of the best sheepskin *G.* of American make, especially men's *G.*, are sold by retailers as *dog-skin G.* In 1878 the U. States imported 720,842 pairs of leather *G.*, valued at $3,195,702. Of this total Germany contributed 343,855 pairs ($1,403,-227); France, 239,866 pairs ($1,189,351); and England, 131,653 pairs ($583,457).

Manuf. The various kinds of leather, and the various fabrics of silk, worsted, flax, cotton, etc., being prepared for, but not by, the *G.* manufacturer, whose work, which consists only in cutting out and sewing up, has been very simple since the introduction of machinery into the trade. The cutting, however, requires much tact, to get the most out of the material, and to employ the best parts in the most conspicuous places.

Imp. duty: Cotton *G.*, 35 per cent; cotton *G.* edged with worsted yarn, 35 per cent; Cotton *G.*, lined with wool waste, 50 cts. per lb. and 35 per cent; hair *G.*, 35 per cent; kid or leather *G.* of all descriptions, 50 per cent; knit *G.* of wool, worsted, or hair (see WOOLLENS); linen *G.*, 40 per cent; silk *G.*, 60 per cent; woollen cloth *G.* and mitts, 50 cts. per lb. and 40 per cent.

Glove-Band, a protection for the glove round the wrist.

Glove-Clasp, a kind of hook-and-eye, or stud, for fastening gloves at the wrist. — A contrivance for buttoning gloves.

Glove-Stretchers, instruments for opening the fingers of gloves, that they may be drawn on the hand the easier.

Glucose, a sugar found in many of the sweet fruits, and often seen crystallized on dried figs, raisins, etc. It is also formed from potato starch, and cellular or woody fibre, by the action of sulphuric acid. It is much less sweet than cane-sugar, and far less soluble in water, requiring 1½ parts of water to dissolve it, while cane-sugar requires only ⅓ part. It is used in the manuf. of beer and alcohol; for adulterating cane-sugar; and instead of gum-arabic for dressing, in weaving and printing woollens, cottons, or silks. It is also advantageously employed by paper-stainers, and for stiffening gauzes, glazing of paper, etc. In 1878 the import of *G.* into the U. States was 2,631,883 lbs., valued at $107,218. *Imp.* duty, 20 per cent.

Glue [Fr. *colle, colle forte*], an inspissated animal jelly, or gelatine, largely employed for cementing wood, also by hatters, printers, and in the arts. The best *G.* is transparent, nearly colorless, and tasteless, has very little smell, even when melted, and is extremely adhesive. The presence of more than a trace of alum is objectionable; an undue quantity may be easily detected by the usual tests. The strongest *G.* is that obtained from skins, more especially from the hides of oxen and cows. That obtained from the bones, cartilages, and tendons is weaker. *G.* is manuf. on a large scale in various places in the U. States, and only a very small quantity of the finest kind is imported from France. *Imp.* duty, 20 per cent.

Manuf. *G.* is principally prepared from the parings and waste-pieces of hides and skins, the refuse of tanneries, and the tendons and other offal of slaughter-houses. These substances, when intended for the *G.*-maker, are steeped for 14 or 15 days in milk of lime, then drained, and dried by exposure to the air. This constitutes what is termed the "cleansing" or "preparation," and in this state the "*G.* pieces," as they are called, may be kept for a long time, and transported to any distance without suffering decomposition. Before conversion into *G.* they are usually again steeped in weak milk of lime, and next well washed and exposed to the air for 24 to 30 hours. They are then placed in a copper boiler two thirds filled with water, and furnished with a perforated false bottom, to prevent them from burning, and as much is piled on as will fill the vessel and rest on the top of it. Heat is next applied, and the whole

gently boiled or simmered together, until the liquor on cooling forms a firm gelatinous mass. The clear portion is then run off into another vessel, and a very small quantity of alum (dissolved) added; here it is kept hot by a water-bath, and allowed to repose for some hours to deposit its impurities, after which it is run into the "congealing boxes," and placed in a cool situation. The next morning the cold gelatinous masses are turned out upon boards wetted with water, and are cut horizontally into thin cakes with a stretched piece of brass wire, and then into smaller cakes with a moistened flat knife. The latter are placed on nettings to dry. The dry cakes of *G.* are next dipped one by one into hot water, and slightly rubbed with a brush wetted with boiling water, to give them a gloss; they are, lastly, stove-dried for sale. This furnishes the palest and best *G.* As soon as the liquor of the first boiling has drained off, the undissolved portion of skins, etc., left in the copper, is treated with fresh water, and the whole operation is repeated again and again, as long as any gelatinous matter is extracted. In this way a second and other inferior qualities of *G.* are obtained. The product from dried *G.*-pieces is about 50 %. — *Hatmakers' G.* is prepared from the tendons of the legs of neat cattle and horses. It is brown, opaque, and soft, and grows moist in damp weather, but it does not render felt brittle like the other varieties. *Fish G.* is made in like manner from various membranous and solid parts of fishes (see ISINGLASS). *Parchment G.* is prepared from shreds or shavings of parchment, vellum, white leather, etc., dissolved by boiling them in water. It is scentless, and nearly colorless.

Liquid G. See CEMENT (CHINESE).

Marine G. is a very tough cement for wood, well adapted for marine and hydraulic purposes. It consists of india-rubber, coal naphtha, and shel-lac, in the proportion of 1 lb. of the first and 4 gallons of the second to a small quantity of the third. It is said that two pieces of wood cemented with this *G.* become stronger than one entire piece. This marine *G.* is also used as a substitute for pitch in paying the seams of ships.

Portable G. [Fr. *colle à bouche*] is made as follows: From the best pale *G.*, 1 lb.; water, quantity sufficient; dissolve in a double *G.*-pot or water-bath, with ½ lb. of pale-brown sugar; continue the heat until the mixture is complete, and pour it into moulds; or pour it on a marble slab, and when cold cut it into small pieces and dry them in the air. This *G.* is very useful to draughtsmen, architects, etc., as it dissolves almost immediately in warm water, fastens paper, etc., without the process of damping, and may be softened for many purposes with the tongue. When great strength is not required, 4 oz more of sugar may be used.

Glue-Pot, a metal pot containing an earthenware vessel immersed in boiling water, to heat the glue in, when required to be used.

Gluten is one of the constituents of all kinds of ripe corn, and of many other vegetable substances. The *farina* or *starch* of the meal is more important in the arts; but chemists recognize a high degree of importance in the function fulfilled by gluten.

Glutton. See WOLVERINE.

Glutinous, viscid or tenacious; having the quality of glue.

Glycerine, a sweet sirupy liquid formed during the saponification of oils and fats. It is a colorless, odorless, uncrystallizable liquid, sweet to the taste, and of a sirupy consistence; it mixes with water in all proportions; it is unctuous and emollient, and softens bodies, like oil, but without greasing them; it does not evaporate or change in the air at ordinary temperatures, and is not susceptible of rancidity or spontaneous fermentation; it is neutral to test-paper, and possesses neither basic nor acid properties; it is easily charged with the aroma of the essential oils, and may be combined with soap, and many other substances, without undergoing change. Sp. gr. 1.27. *G.* is extensively employed in medicines, and also for a great variety of purposes other than medicinal; such, for example, as for keeping clay moist for the modeller, for preventing mustard from drying up, for keeping snuff damp, for the preservation of fruit, for sweetening liqueurs, wine, beer, and malt extracts. It is also used as a lubricant for some kinds of machinery, more especially for watch and chronometer works, because it is unaffected by contact with the air, does not thicken at a low temperature, and is without action on such metals as copper, brass, etc. *G.* is also an ingredient in copying inks. It renders printing-ink soluble in water; indeed, it is an excellent solvent for many substances, including the Tar-colors (aniline blue, cyanine, aniline violet, and alizarine), and arsenious acid. It is also added to the pulp of paper in order to render it soft and pliable. It is said that leather driving-belts, made as they usually are of weakly tanned leather, when kept in *G.* for twenty-four hours are not so liable to fray. A solution of *G.* in water is now largely used instead of water alone for the purpose of filling gas-meters, as such a solution does not freeze in winter nor evaporate in summer. It has also been used for the compasses on board screw-steamers, in order to protect the inner compass-box against the vibrations caused by the motion of the propeller. It is also employed for the preservation of anatomical preparations, and for mounting microscopic specimens, as well as for rendering wooden casks impervious to petroleum or other oils. When treated with concentrated nitric acid, *G.* yields nitro-*G.* Even the above long list does not exhaust the many useful purposes to which *G.* is now applied. *Imp.* duty, 30 per cent.

Manuf. One of the best methods for preparing *G* is as follows: Superheated steam of from 550° to 600° F. is introduced into a distillatory apparatus containing palm-oil or other fatty body. The action of the steam effects the decomposition of the fat, and *G.* and the fatty acids distil over together, but no longer in combination. In the receiver the condensed *G.*, from its higher sp. gr., sinks below the fatty acids. Sufficient steam must be supplied, and the temperature nicely regulated. The *G.* is concentrated by evaporation, and if discolored it is re-distilled. It is usually prepared with sp. gr. 1.24, and then contains 94 % of anhydrous *G.* It can, however, be concentrated to sp. gr. 1.26 when it contains 98 %.

Glyphography, Galvanoglyphy, a process to cheapen or simplify wood-engraving. A drawing is etched on a zinc plate, coated with varnish; several coats of ink are spread over the plate by a small composition-roller, being deposited only on those parts where the varnish has not been broken through by the graver. When the hollows are deep enough, the plate is placed in connection with the galvanic battery, and the result is another plate, in which the hollows of the engraving are produced in relief.

Gnatoo, the name in some of the Pacific islands for clothing made from the bark of the Chinese paper mulberry.

Gnomon, the land or style of a sun-dial.

Go, a slang term for a dram or glass of spirits.

Goat, a well-known quadruped (*Capra*), nearly the size of the sheep, to which it is allied, but stronger, less timid, and more agile; and having horns hollow, erect, and scabrous. Species of this animal are found in many parts of the world, but that which is domesticated in America (*C. hircus*) is perhaps peculiar to Europe. In the S. of Europe, particularly Spain and Italy, *G.* are more extensively reared, and flocks of them are very common. The animal is not long lived. Its young are brought forth in March or April, and two are commonly produced at a birth. It feeds on the coarsest herbage, delights to frequent rocks and mountains, and may be reared profitably in such districts as will not carry sheep. Its flesh is esteemed as food in the countries where it abounds, and the haunches are frequently salted and dried; the female is in request for her milk; the horns are useful for knife-handles; and superior candles may be made of the suet; but the part most valued is the skin, particularly that of the kid, which is extensively used in the glove manufacture. *G.*-skins are largely imported into the U. States, where they are manufactured into morocco leather. Those which are brought from Tampico, Matamoras, and Vera Cruz are worth about 20 per cent

more than those coming from Buenos Ayres. In the age of wigs the hair of the *G.* was in great request, and even yet the pure white wigs sometimes worn in England by lawyers and clergymen are made of it, — the long thick hair on the haunches being that generally preferred. The *Angora G.*, inhabiting the district around Angora and Beibazar, in Asiatic Turkey, is in high estimation for its soft and silky hair. The *Cashmere*, or *Thibet G.*, is a small, beautiful creature, greatly valued for a delicate wool procured from between its long hairs. See ANGORA WOOL, CASHMERE SHAWLS, etc. *Imp.* duty: Living, 20 per cent; hair (see HAIR); skins (see SKIN).

Goats' Rue, the roots of the *Galega virginiana*, used in medicine.

Goats' Wool. See ANGORA WOOL.

Gobbing, rubbish remaining after coal has been extracted from the coal-mine.

Gobelins. See TAPESTRY.

Goblet, a tankard, or drinking-cup.

Go-Cart, a small machine or frame without a bottom, running on casters or rollers, for teaching infants to walk.

Gock, a name in parts of Scotland for a deep wooden dish.

Godavez, an Indian name for the *Calamus aromaticus*, or sweet cane.

Godron, plaits on sleeve-ruffles, or on ladies' caps.

Goelack, a weight in Java, principally used for pepper, about 2 lbs.; in some parts 200 goelacks make a bahar.

Goelette [Fr.], a schooner.

Goffering, the operation of plaiting, puckering, or fluting linen, lace, etc.

Goggles, eye-blinds for horses. — Tubes or glazed cases in front of the eyes of a horse, to protect them from dust or intense light.

Goglet, a sort of pottery jar, or earthenware vase, for keeping water cool.

Gogul, a kind of bitumen, used in India for painting ship-bottoms.

Gokokf, a collective name for breadstuffs and several kinds of pulse eaten in Japan, meaning the five fruits of the field, as rice, barley, wheat, soy beans, and dried beans.

Golah, the Hindostani name for a warehouse.

Gold, the most valuable, and probably the largest known, of all the metals. From the remotest period it has been esteemed for its beauty and permanence, and has been taken as the standard measure of value amongst all civilized nations. An account of the uses of *G.* in the arts, and its influence on society in all ages, as a symbol of wealth and an article of ornament and utility, would embrace the whole history of mankind. At the present day it alike contributes to the conveniences, comforts, and luxuries of life; as often exciting the baser passions of the human heart as promoting the cause of benevolence and virtue. *G.* is of an orange-red or reddish-yellow color, and has no perceptible taste or smell. Its lustre is considerable, yielding only to that of platinum, steel, silver, and mercury. It is rather softer than silver. Its sp. gr. is 19.3. No other substance is equal to it in ductility and malleability. It may be beaten out into leaves so thin that 1 grain of *G.* will cover $56\frac{3}{4}$ sq. inches. These leaves are only $\frac{1}{282000}$ inch thick. But the *G.* leaf with which silver wire is covered has only only $\frac{1}{12}$ of that thickness. An ounce of *G.* upon silver is capable of being extended more than 1,300 miles in length. Its tenacity is considerable, though in this respect it yields to iron, copper, platinum, and silver. A *G.* wire 0.078 inch in diameter is capable of supporting a weight of 150.07 lbs. avoirdupois without breaking. It melts at 32° of Wedgwood's pyrometer. When melted it assumes a bright bluish-green color. Unlike the great majority of the metals, it does not rust, i. e. oxidize in the air, neither does it, if pure, tarnish by exposure. In this respect it contrasts strikingly with silver, which, though indifferent to the rusting action of oxygen, is rapidly blackened by the sulphuretted hydrogen of the atmosphere. Exposed gilding tarnishes, but only because it is alloyed with silver and copper, on which this prejudicial gas can act. *G.* is readily crystallizable, and always assumes one or other of the symmetrical shapes, such as the cube, or regular octahedron, which characterizes the simplest crystallographic system. *G.* melts at a high white heat, and remains unchanged in the hottest furnaces. In the focus of a lens, however, it is vaporized by the sun's rays; and the oxyhydrogen blowpipe, or large voltaic battery, can also develop heat sufficient to volatilize it. It contracts in the act of solidifying from a state of fusion, and cannot, in consequence, be made to receive sharp impressions by casting it in moulds. Coins, accordingly, and plate are stamped or embossed, and afterwards ebased and carved, if necessary, by cutting tools. *G.* does not dissolve in any of the ordinary acids, such as the nitric, sulphuric, hydrochloric, or acetic, but a rare acid, the selenic, can dissolve it. Its best solvent is a mixture of hydrochloric acid, with some oxidizing agent like nitric acid or oxide of manganese, which causes the hydrochloric acid to part with its chlorine. If the *G.* be in leaf, chlorine at once unites with it, and the resulting chloride is readily soluble in water. Bromine acts in the same way on the metal; and it may also be dissolved by boiling it with sulphur, potash, and water. The older chemists speculated on the possibility of Moses having dissolved the golden calf of the Israelites in this way. *G.* is also soluble in mercury, and advantage is largely taken of this property of quicksilver to dissolve the precious metal from its ores. The *G.*-amalgam resulting from the union of the metals is also extensively employed in gilding.

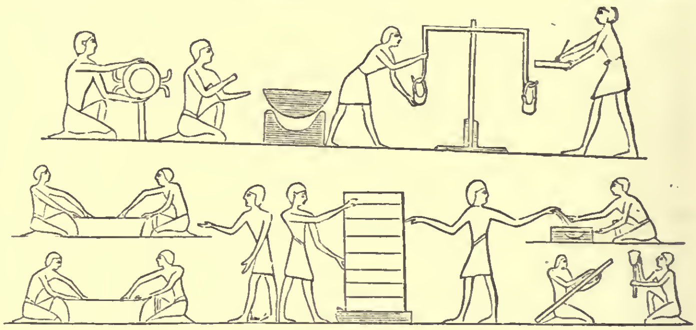


Fig. 238. — EGYPTIAN GOLD-WORKING.
(*From the Tombs at Beni-Hassan.*)

G. is, next to iron, the most widely diffused metal on the surface of the earth, but is only found in paying quantities in a few countries. It is never met with in regular veins, but in primitive or igneous rocks, or in deposits formed by the disintegration of these. In California it is chiefly found in material which has been formed by the wearing down of quartz and granite rocks. The metal is sometimes in the form of grains or flakes, or in moss-like threads, embedded in the quartz; sometimes in the form of well-defined crystals, sometimes in rough lumps, or *nuggets*. Fig. 239

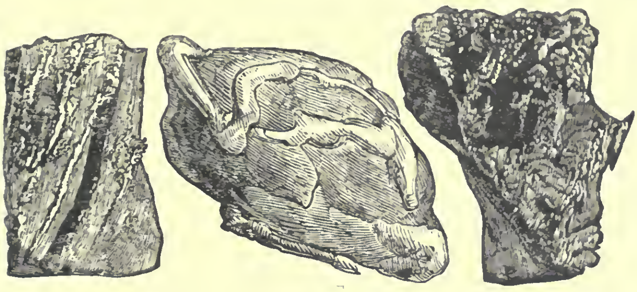


Fig. 239. — Gold in Quartz.

shows three of the various modes in which *G.* is found disseminated through quartz. The soil, which has been formed by the disintegration of masses of auriferous quartz, is full of *G.*, so that a patch of such soil 12 feet square has been known to yield 30 oz. of *G.* by a very rough kind of washing to the depth of 1 ft. Soil of this kind has been carried down by rivers and streams ages ago; and the lighter particles having been carried off by the water, while the *G.*, from its greater sp. gr., remained at the bottom of the stream, the sands and gravel of these river-beds are very rich in *G.* The methods of carrying on the *G.*-seeking operations vary according to the nature of the deposit which is worked and the resources of the miner. The simplest, which was that most practised in the early days of the *G.*-fields, consists in throwing into a tub several shovelsful of the surface soil, and in pouring in water while the contents of the tub are stirred about with a spade. The lighter matters are washed away, but the *G.*, by its great sp. gr., remains behind. An improvement in this, but still a very rude process, is practised by aid of the *cradle*, which is merely the trunk of a tree, hollowed out, and provided with transverse partitions and ribs. The cradle is rocked, so that the water may wash away all but the *G.* and the heavy stones. Machines for puddling by horse-power are now in use, and other contrivances have superseded the tub and the cradle in *surface washing*. The auriferous earth obtained by excavating the soil from pits is washed in a similar manner, as is also the material reached by penetrating the deeper tertiary deposits, and by driving adits or tunnels along the ancient river-beds beneath the layers of basalt. A mode of washing accumulations of auriferous earths by streams of water is employed where circumstances are favorable. A long inclined channel is constructed, and lined with boards; or, when the natural inclination of the soil requires it, a long trough is constructed and supported on trestles. The bottoms of the troughs are crossed by a number of traverse bars, which arrest the auriferous particles in their descent. The *sluce*, or series of troughs, may be from 50 feet to several thousands of feet in length, and the cost from $500 to $40,000. The earth is thrown in at the upper part of the trough, and is gradually washed down, the water being allowed to flow in some cases by night as well as by day, but commonly in the daytime only, as the troughs must be watched, to see that they do not become choked up, and the soil washed out by the overflowing water. The *run* goes on for six or ten days, and then the current is stopped for a *cleaning-up*, which occupies from half a day to a day. For this operation the stream of water is stopped, and quicksilver is used to dissolve the grains of *G.* from the sand, etc., collected by the *riffle-bars*. The quick-silver is afterwards expelled from the amalgam by heat, and the gold remains as a porous mass. Sometimes, instead of shovelling the earth into the troughs, it can be washed out of its position into suitable channels by means of a powerful jet of water. This mode of working, which is termed *hydraulic jet sluicing*, offers great advantages where the natural conditions admit of its adoption. In this plan, instead of bringing the auriferous earth to the water, the water is brought to the earth by a flexible pipe, like the hose of a fire-engine, from a reservoir about 200 ft. higher, and the stream is directed upon the material by a nozzle. This powerful jet of water is used to separate and carry away the earth to the head of a system of channels and troughs, like those already described. The hose has a diameter of 8 in., but the orifice of the nozzle, from which the water issues, is contracted, in order to increase the force of the jet. The hydraulic jet sluicing requires from three to six men to work it, and the material of a hill can be carried into the sluices in less time than a hundred persons could do it by spades. The *G.* which is embedded in quartz and other minerals, as shown in Fig. 239, is obtained by crushing the material in stamping-machines, which are usually constructed with logs of wood shod with iron. In another form of crushing-mill two large cast-iron rollers are used instead of stampers. From the crushed material the particles of *G.* are extracted by amalgamation with mercury, which is afterwards removed by distillation.

For the year 1878 the *G.* yield from all regions in the U. States was as follows, according to the figures given in the Mint Bureau report: —

California	$15,260,679	Oregon	$1,000,000
Nevada	19,546,513	Washington	300,000
Colorado	3,366,404	Dakota	3,000,000
Montana	2,260,511	North Carolina	150,000
Idaho	1,150,000	Georgia	100,000
Utah	392,000	Other sources	25,000
Arizona	500,000		
New Mexico	175,000	Total	$47,226,107

The *G.* coin and bullion existing in the U. States October 30, 1879, was $355,681,532, according to estimation given by the Secretary of the Treasury.

For *G.* considered as a legal tender, see Money. For the comparative quantities of *G.* produced, and the places where it is produced, see Precious Stones.

Assay of G. The quantity of *G.* in an *alloy* is usually estimated by "assaying" the sample. Before proceeding to the assay, it is necessary to form some estimate of the quantity of other metals (copper or silver, or both) in the specimen to be examined, in order to employ the proper proportion of lead in

the "cupellation." The experienced assayer commonly does this by the "assay of the touch," and, in certain cases, by a rough preliminary assay. The quantity of lead employed may be about 16 times the weight of the copper present in the sample, and when the alloy contains silver an additional allowance of lead, equal to $\frac{1}{10}$ of its weight, is made on that account. When no silver is present, or it is not required to be estimated, a much larger proportion of lead may be employed. The weight taken for the assay ("assay pound") is usually 12 or 6 gr. The alloy and dose of lead being accurately weighed and separately wrapped in small pieces of paper, the assay may be at once proceeded with. — *Cupellation.* This operation, the most important of the whole, has been already described. Unlike silver, *G.* will bear the highest heat of the furnace without "vegetating," "fuming," or being absorbed by the cupel. The loss of weight gives the amount of copper in the alloy. — *Quartation.* The cupelled sample is fused with three times its weight of pure silver (called the "witness"), by which the *G.* is reduced to one fourth of the mass, or less, and in this state may be easily removed. — *Parting.* The alloy, after quartation, is hammered or rolled out into a thin strip or leaf, curled into a spiral form, and boiled for a quarter of an hour, in a small flask, with about $2\frac{1}{2}$ to 3 oz. of nitric acid (sp gr. 1.3); and the fluid being poured off, it is again boiled in a similar manner with $1\frac{1}{2}$ to 2 oz. more of nitric acid (sp. gr 1.2), after which the *G.* is carefully collected, washed in pure water, and dried. When the operation of "parting" is skilfully conducted, and the acid not too strong, the metal preserves its spiral form; otherwise, it falls into the state of flakes or powder. The second boiling or digestion is technically termed the "reprise." The loss of weight by "parting," after deducting that of the "witness," corresponds to the quantity of silver originally in the specimen. — *Annealing.* This consists in putting the pure *G.* obtained by the last process into a small porous crucible or cupel, and heating it to redness in the muffle. — *Weighing.* This must be done with the utmost accuracy. The weight, in grains troy, doubled or quadrupled, as the case may be, gives the number of carats fine of the alloy examined, without calculation.

Dutch G., *Mannheim*, *Or-molu*, *Pinchbeck*, *Prince's metal*, *Similor*, names applied to several varieties of fine *G*-colored brass, differing slightly in tint and in the proportions of copper and zinc. The terms tombac, prince's metal, similor, and Mannheim *G.* are used by some authors to designate alloys consisting of about 85 % of copper and 15 % of zinc; whereas, according to other authors, prince's metal and Mannheim *G.* are synonymous, and are composed of 75 % copper and 25 % zinc; according to another author, similor consists of about $71\frac{1}{2}$ % copper and $28\frac{1}{2}$ % zinc, and Mannheim *G.* of 80 % copper and 20 % zinc; and, again, according to another author, similor and Mannheim *G.* are synonymous, and are applied to alloys of copper containing from 10 to 12 % zinc and from 6 to 8 % tin. Seeing that such inextricable confusion exists in the employment of the terms above mentioned, it is desirable to discard them altogether. At the celebrated works of Hegermühl, near Potsdam, the proportions copper, 11 parts, to zinc, 2 parts, are employed to produce a metal which is afterwards rolled into sheets for the purpose of making Dutch *G.*-leaf. This alloy has a very rich, deep *G.* color. Its malleability is so remarkable that it may be beaten out into leaves not exceeding $\frac{1}{52000}$ inch in thickness. See DUTCH GOLD-LEAF.

Jeweller's G. This term is applied to alloys of *G.* used for trinkets and inferior articles of jewelry, ranging from 3 or 4 carats fine upwards. The lowest alloy of this class is formed of copper, 16 parts; silver, 1 to $1\frac{1}{2}$ parts; *G.*, 2 to 3 parts; melted together. This is worth only from $2.15 to $2.85 the oz. It has recently been found that *G.* of the quality of 12 carats, or less, if alloyed with zinc instead of the proper quantity of silver, presents a color very nearly equal to that of a metal at least $2\frac{1}{2}$ to 3 carats higher, or of $2 to $2.75 an ounce more value; and the consequence has been that a large quantity of jewelry has been made of *G.* alloyed in this manner; and the same has been purchased by some traders, very much to their own loss as well as that of the public; inasmuch as a galvanic action is produced, after a time, upon *G.* so alloyed, by means of which the metal is split into several pieces, and the articles rendered perfectly useless.

Trichloride of G., a substance consisting of 1 part *G.*, dissolved by aid of heat in 8 parts of nitro-hydrochloric acid, and evaporated down to near dryness, and allowed to crystallize in orange-red needles, or ruby-red prismatic crystals. It is deliquescent; soluble in water, ether, and alcohol, forming a deep-yellow solution. It is employed in medicine, but its most important use is as a reagent in photography, large quantities being manufactured for use as a chief agent in toning photographic prints. To some extent it is also used for electro-gilding; and, mixed with excess of bicarbonate of potassium, it forms a good yielding solution for small articles of copper. These are to be first cleaned with dilute nitric acid, and then boiled for some time in the mixture. The above is the salt generally referred to under the name of the *chloride of G.*, or in commerce occasionally as the *muriate of G.*

Imp. duty: *G.* bullion and coin, free; *G.* jewelry, 25 per cent; *G.*-leaf, $1.50 per package of 500 leaves. See, besides, the names of articles made of *G.*

Gold-Amalgam, a yellowish white mineral which is a mixture of gold and quicksilver.

Gold-Beater, a hammerer of gold into leaves or sheets. See GOLD-LEAF.

Gold-Beater's Mould. See GOLD-BEATER'S SKIN.

Gold-Beater's Skin is one among many forms of thin membrane useful in the arts. It is made from the intestine of the ox, which is scraped to remove the fatty matter; then turned inside out in order to be scraped and washed on both surfaces; then left to ferment to loosen the mucous and peritoneal membranes; then scraped against a blunt edge to remove these membranes. After various scrapings and cleansings in alkaline solutions, two membranes are placed together, with the mucous surfaces in contact; and each pair, after various processes of steeping, beating, pressing, and drying, in which solutions of alum and white of egg are employed, form one sheet or leaf of gold-beater's skin, — a thin but tough and very peculiar substance. It is used for medical and various other purposes, but chiefly by the gold-beater (see GOLD-LEAF). A *mould* of gold-beater's skin contains 800 to 1,200 leaves, about $5\frac{1}{4}$ inches sq. It is said that 500 oxen yield only enough of this peculiar membrane to make one mould of 800 leaves. The making of this substance is a dirty and repulsive trade, but the product in the form of a mould of leaves is worth from $40 to $50. *Imp.* free.

Gold-Beating. See GOLD-LEAF.

Gold-Burnisher, a workman who polishes and brightens articles made of gold.

Gold-Caster, one who moulds, or runs, gold into different shapes and articles.

Gold-Chaser, a workman who embosses gold.

Gold-Cloth, a cloth of gold wire.

Gold-Coinage, the current gold coins of the country. See DOLLAR, EAGLE, and also MONEY.

Gold-Cutter, a workman who prepares gold for the use of others.

Gold-Digger, a seeker for gold.

Gold-Dust, gold ore met with in fine grains or particles of gold, as washed from the earth and clay in the gold-fields.

Golden, made of gold; of the color of gold.

Golden-Yellow, a pigment of sulphur of antimony, which produces an orange-yellow.

Gold-Field, an auriferous deposit and diggings in a locality where gold is found.

Gold-Fish, a small ornamental species of carp, *Cyprinus auratus*, which is kept in tanks, globes, or ponds, for their beauty and gentleness.

Gold-frame Maker, a manufacturer of gilt picture and looking-glass frames.

Gold-Lace (more properly *gilt-lace*), a thin covering of gold applied to a surface of silver, which again has a foundation of silk. The silken threads for making this material are wound round with gold wire so thickly as to conceal the silk; and the making of this gold wire is one of the most singular mechanical operations imaginable. In the first place, the refiner prepares a solid rod of silver, about an inch in thickness; he heats this rod, applies upon the surface a coating of gold-leaf, burnishes this down, applies another coating, burnishes this down, and so on, until the gold is about one hundredth part the thickness of the silver. Then the rod is subjected to a train of processes which brings it down to the state of a fine wire; it is passed through holes in a steel plate, lessening step by step in diameter. The gold never deserts the silver, but adheres closely to it, and shares all its mutations; it was one hundredth

part the thickness of the silver at the beginning, and it maintains the same ratio to the end. It has been calculated that the gold on the very finest silver wire for gold-lace is not more than *one third of one millionth part of an inch* in thickness; that is, not above one tenth the thickness of ordinary leaf-gold. — In the original method of gold-lace making, a stiff thread was produced, long used for making cloth of gold, etc., but manufacturers have been enabled to apply gold to flexible thread by means of recent inventions. The process of coating flexible threads with gold film is called *fibre-gilding*. Chemists and manufacturers have long tried to overcome the many difficulties which stand in the way of fibre-gilding, and all the chemical and metallurgical processes have been successively tried; but although it was found easy to attach the gold to the thread, yet the whole was too long in drying, and had too soft a foundation, to admit of burnishing. The brilliancy of gold-lace produced by fibre-plating has never been surpassed or even imitated by any of the processes invented. Among the principal methods in use are the chemical processes of Mr. Albert Hock and Mr. Green, and that of Dr. Kroning of Stolberg. Electro-metallurgy has not been rendered directly applicable; but by M. Barot's method, the material to be gilt is dipped in a solution of nitrate of silver and ammonia. After remaining two hours, and dried, it is exposed to a current of pure hydrogen gas. A silvered surface is thus produced, which can easily be gilt by the electro-metallurgic process.

Gold-Leaf, an extremely thin tissue of gold, prepared by beating the gold metal until the requisite degree of fineness has been obtained. It is found that a minute percentage of silver and copper is necessary to give the gold for gold-leaf a proper malleable quality, — a percentage of perhaps one in 70 or 80. The refiner manages this alloy, and brings the costly product to a certain stage of completion; he melts the gold and the cheaper alloys in a black-lead crucible; he pours the molten metal into an ingot mould, six or eight inches long; he removes the solidified and cooled ingot from its mould, and passes it repeatedly between two steel rollers until it assumes the thickness of a ribbon; and this ribbon, about one eight hundredth of an inch in thickness, and presenting a surface of about 500 square inches to an ounce, passes next into the hands of the gold-beater. — The ribbon being cut into inch-square pieces, 150 of these are interleaved with thick paper, and enclosed in a parchment case called a *cutch*. The cutch is subjected to a long-continued series of blows, administered to all parts of both surfaces equally with a 16-lb. hammer which has two somewhat rounded faces, on a smooth marble slab. When each gold piece has been stretched out by this beating to 4 sq. in., the cutch is opened, the pieces are cut into four of 2 sq. in. each, and these are interleaved in a book of gold-beater's skin called a *shoder*, the 150 pieces being now 600. Another beating with a 9-lb. hammer spreads out these as before, and another cutting augments the number from 600 to 2,400. These are separated into three packets of 800 each, and each of these packets is again beaten in a book of gold-beater's skin called a *mould;* this beating, lasting four hours, is with a 7-lb. hammer. The leaves of gold, now reduced to the proper thickness, are cut with smooth wooden knives into $3\frac{1}{4}$ sq. in.; twenty-five of these leaves are interleaved in a book, the paper of which has been rubbed over with red chalk to prevent adhesion; and four such books, containing 100 leaves of gold, are worth about $1.25. According to the tint, the gold obtains the technical names of fine, red, pale red, deep orange, lemon, pale, party, white, etc. Gold-leaf is the thinnest substance produced in the mechanical arts, being only $\frac{1}{280000}$ of an inch in thickness. A medium kind is made of 42 parts pure gold, 12 silver, and 6 copper. Silver-leaf and copper-leaf, and mixtures of the two, can be beaten out, but not to such an excessive thinness as gold-leaf. *Dentists'* gold is thicker than ordinary gold-leaf, being carried no further in the process than that of the cutch. It should be perfectly pure gold. *Imp. duty*, $1.50 per package of 500 leaves.

In beating gold, the dryness of the cutch, shoder, and mould is a matter of extreme delicacy. They require to be hot-pressed every time they are used, although they may be used daily, to remove the moistnre which they acquire from the atmosphere, except in extremely frosty weather, when they acquire so little moisture that then a difficulty arises from their over-dryness; the brilliancy of the gold is diminished, and it spreads very slowly under the hammer. On the contrary, if the cutch or shoder be damp, the gold will become that which is technically termed hollow or sieve-like; that is, it is pierced with innumerable small microscopical holes; and in the moulds in its more attenuated state it will become reduced to a pulverulent state. This condition is more easily produced in alloyed golds than in fine gold. It is necessary that each skin of the mould should be rubbed over with calcined gypsum (the fibrinated variety) each time the mould may be used, in order to prevent the adhesion of the gold to the surface of the skin in the process of beating.

Gold-Mounter, one who ornaments, frames, or sets articles in gold.

Gold of Pleasure, the *Camelina sativa*, a plant much cultivated in Europe for its seeds, which produce a fine oil; the stems also yield a coarse fibre used for making sacks, sail-cloth, and coarse packing-paper, and are employed for thatching.

Gold-Paper, a fancy paper, the surface of one side of which is covered with a gold-size.

Gold Pen. The manufacture of pens of elastic material furnished with durable points of some extremely hard substance began in England with attempts to secure bits of metal to pens made of glass, tortoise-shell, and horn. This finally led to the production of gold pens, the manufacture of which is carried to the highest perfection in New York, the best pens being made here and sent to Europe and other parts of the world. In 1823 John Isaac Hawkins, an English engineer, embedded pieces of diamond and ruby in the points of tortoise-shell pens, which were softened in water to receive the stones. The same manufacturer, hearing that bits of an extremely hard native alloy of iridium and osmium, sent by Dr. Wollaston to a penmaker to be used for points, had been returned as too hard for working, obtained these for his own experiments, and was the first to produce the famous "diamond points" soldered to gold pens. The right to make gold pens was purchased of Mr. Hawkins by Mr. Cleveland, an American clergyman then in England, who on his return, in 1835, induced Levi Brown, a watchmaker in Detroit, to undertake their manufacture. The experiment was attended with little success. Mr. Brown removed in 1840 to New York, and there introduced the business, which gradually increased in importance as the quality of the pens was improved, and the price diminished by their more rapid production. At first the pens were cut with scissors from a thin flat strip of gold, and a slit being cut in the nib a bit of iridium was soldered to each point separately, and the points were then rounded up into shape with a mallet upon a stick. The inferior pens thus made by hand sold for $5 to $10 each. The first machines, and almost the only important ones in use applicable to the differ-

ent branches of this work, were invented and first manufactured by Mr. John Rendell in 1844. Mr. Bagley systematized the process, giving to each workman his peculiar branch, and thus nicety and certainty of good work were attained. Great improvements have been introduced, and active competition, with an extensive demand, has resulted in the production of perfect gold pens at less than one half the early price.

Different manufacturers have different modes of operation, but the following will give a general idea of the perfected method employed in the large and old establishment of Messrs. Mabie, Todd, & Bard, at New York: Sheet or plate gold, about $\frac{1}{32}$ of an inch in thickness, is cut by means of a lever-press with die set into stubs, or small pieces, each piece having a point at one end. A machine then indents the point for the reception of the nib, and a small particle of iridium is fastened to the golden point with a flux and sweating the gold, which makes the pen much more durable than it was when a solder was used. The gold, after being hammered to give it elasticity, is cut to the proper shape with a die, stamped with the manufacturer's name and any other device, and turned up to the rounded quill-like form. This is made by the "raising-up machine," a screw press of great power, with many parts and very expensive fittings. The iridium is then split into a nib by a rapidly revolving copper disk, and another machine extends the slit into the gold. The point is ground on revolving copper wheels, which is the most important part of the manufacture, the skill of the grinder making the writing quality of the pen either coarse or fine. After grinding, the finished pen is finally polished. Thus prepared, a gold pen is everlasting; the gold resisting the corrosive action of ink, while the iridium point will bear an infinite amount of work without wearing away. *Imp.* duty, 40 per cent.

Gold Plate, dishes or table service of gold.

Gold-Printer, a printer who does ornamental printing, letter-press, or lithography, in gold.

Gold-Shell, or **Shell-Gold**, used in painting and illuminating, is made by grinding gold leaves with honey, and afterward separating the honey from the powdered gold by means of water. When the honey is washed away, the gold may be put on paper or kept in shells. When used, it is commonly diluted with gum-water. The German gold-powder, prepared in this manner from the Dutch gold-leaf, is generally used; and when it is well secured with varnish, it answers the end in japanners' gilding tolerably well.

Gold-Size, a kind of gold-paint or thick tenacious varnish used for burnished gilding. It is prepared of 1½ pounds of pipe-clay, ½ an ounce of red chalk, ¼ of an ounce of black lead, 40 drops of sweet oil, and 3 drams of pure tallow. The clay, chalk, and black lead are to be ground very fine, separately, in water, then mixed together; the oil and tallow are next added, and the mixture is ground to a due consistence.

Goldsmith, one who manufactures vessels and ornaments of gold and silver; a manufacturing jeweller.

Gold-Thread, thread used for embroidery, consisting of flattened silver-gilt wire closely twisted, or wrapped over a thread of yellow silk by machinery.

Gold-thread Root, a name for the roots of some species of *Coptis*. In the U. States, the root of *C. trifoliata* is a popular remedy for aphthous affections of the mouth in children. In India, the golden thread root of *C. teeta* of Assam, which is intensely bitter, brings a very high price, being deemed a tonic remedy of the greatest value.

Gold Wire is made by taking a cylindrical ingot of silver which has been superficially coated with gold, and drawing it successively through a series of holes in a hardened steel plate, each of which is a degree smaller than the preceding hole, and proceeding thus until the requisite degree of fineness is attained. It may be observed that in this process, however fine be the wire, its gilded surface exhibits no flaw, even when viewed by the microscope. *Flattened gold wire* is the same wire after it has been passed between rollers of polished steel.

Goloe-Shoes, an overshoe of caoutchouc or leather for keeping the feet dry, generally called *goloshes*.

Golpathen, an Indian striped silk.

Golsch, a name in Würtemberg for a piece of cloth measuring 72 aunes, or ells.

Golt-Shut, a gold or silver ingot.

Gomastah, a native factor, or agent, in the East Indies.

Gombo, Gumbo, the *Hibiscus cannabinus*, a plant of the order *Malvaceæ* (Fig. 240), which

Fig. 240. — Gombo Plant.

yields a strong fibre. From its pod a soup is made in Louisiana.

Gome, grease for cart-wheels.

Gomeh, in India, a handful; literally, as many rice-stalks, with ears attached, as can be grasped by the hand.

Gomelin, a kind of German dextrine (starch from potatoes), in crystals and in powder, used as weavers' glue for cotton warps, and for dressing printed calicoes.

Gomuti, or **Ejoo**, a species of palm (*Borassus gomutus*) growing in the Indian islands. A valuable product is obtained from this palm, resembling *black horse-hair*; it is found between the trunk and branches, at the insertion of the latter, in a matted form, interspersed with long, hard, woody twigs of the same color. When freed from the latter, it is manufactured by the natives into cordage. Its fibres are stronger and more durable, but less pliant, than those of the cocoa-nut, or coir, and it is, therefore, fitter for cables and standing rigging, but less fit for running rigging. The native shipping of the eastern islands of all kinds are chiefly equipped with cordage of the *G.*; and the largest

European shipping in the Indies use cables of it. It undergoes no preparation but that of spinning and twisting; no material similar to our tar and pitch, indispensable to the preservation of hempen cordage, being necessary with a substance that, in a remarkable degree, possesses the quality of resisting alternations of heat and moisture. The *G.* of Amboyna and the other Spice Islands is the best. That of Java has a coarse ligneous fibre. *G.* is generally sold in twisted shreds, or yarns, often as low as one dollar a picul, and seldom more than two.

Gonakie Gum, a bitter variety of Senegal gum.

Gonaives. See Hayti.

Gondola, a kind of barge used chiefly on the canals of Venice, where gondolas supply the place of carriages. The *G.* is flat-bottomed, very long and narrow (averaging about 30 feet by 4), and its two sharply pointed extremities are curved upward to the full height of a man. It is also provided with a small chamber placed near its centre, and elevated to a convenient height above the line of the gunwale. It is propelled by oars or a pole by the gondolier, who stands at the stern.

Goneometer, an instrument for measuring the angles of crystals.

Gong, a Chinese musical instrument of percussion, formed entirely of metal, which yields a very loud and peculiarly harsh sound when struck with force. It is made of an alloy of 25 parts of tin and 100 parts of copper, and in form it nearly resembles the common tambourine. *G.* are much used in China for making loud sonorous signals, particularly on the canals, as well as for adding to the clangor of martial instruments.

Gongonah, a variety of maté, or Paraguay tea, used in Brazil, prepared from the leaves of *Ilex gongonah* and *I. theezans*, species of holly.

Gonje, a small weight used in India for precious metals, nearly two grains.

Good Hope (Cape of). See Cape of Good Hope.

Goods, a general name for movables, but usually restricted to merchandise; heavy traffic; property; wares.

Goods-Train, the English term for a railroad freight-train.

Good-Will, the custom of any business or trade; that interest in it which is sold along with the goods and premises. By disposing of the good-will, the seller binds himself to do everything in his power to advance the interests of his successor in the business, and to recommend him to his customers. It is also usual to specify that the seller shall not enter upon the same business within a certain distance of that which he has sold. Such a contract is good at law, and the party infringing it is liable in damages.

Googul, a resinous substance resembling myrrh, met with in India, believed to be the bdellium of commerce, and probably the produce of *Commiphora Madagascarensis.*

Goolcund, a conserve flavored with roses, made in the East.

Goolo, a pottery vessel made in the Feejee islands.

Goondooming, a seed or bead used in some parts of the East as a weight for gold and silver; three of these make one canteroy, or fanam, which is about 5.875 grains.

Goor, a name in India for coarse or half-made sugar; the concentrated sirup or juice of the date-palm (*Phœnix dactyliferus*). It is also called jaggery; 12 pints of the sap are boiled down to 1 of goor, and 4 of goor yield 1 of good powder sugar.

Goose, a genus of web-footed birds; the tame *G.* (*Anser domesticus*) is well known, and is largely reared for its flesh, quills, and feathers. Wild geese in the winter are sometimes brought to market. — A tailor's smoothing and pressing-iron.

Gooseberry, the fruit or berry of *Ribes grossularia* and *Ribes uva-crispa*, of which there are several varieties. This fruit, when ripe, is wholesome and slightly laxative. The juice of the unripe fruit is made into wine called *English champagne*. *G.* are preserved by simply bottling them, and keeping them in a very cold place.

Goose-Grass, the *Galium aparine*, a plant common in Europe and America, the expressed juice of which is variously prepared in medicine, and the herb itself is used in the form of ointments or decoctions.

Goose-Neck, on shipboard, an iron ring fitted at the end of a yard or boom, for various purposes. — A nozzle having a universal-joint connection to the stand-pipe of a fire-engine.

Goowa, the Bengalee name for the betel-nut, *Areca catechu.*

Goracco, prepared tobacco; a paste smoked in their hookahs by the natives of Western India. The tobacco having been cut very fine, molasses, cinnamon, musk, and other aromatics and perfumes are added, until the mass assumes the form of an electuary.

Gordonia. See Loblolly Bay.

Gore, a narrow strip of any fabric to let in to another piece. — An angular or oblique piece of canvas which increases the breadth or depth of a sail.

Gorgerette [Fr.], a woman's kerchief.

Gorgonelle, a Dutch cloth.

Gorse, another name for furze or whin.

Goslanite, a name for sulphate of zinc, use in medicine and in dyeing.

Gossamer, a very thin gauze, or finely woven siken web.

Gotah, an Indian name for tissues.

Gottenburg. See Sweden.

Gouge, a semi-circular, hollow, scooping chisel, for making a rounded groove in cutting or turning wood. — In bookbinding, a finisher's hand-tool having a curved face, and used for blind-tooling and gilding.

Gouge-Bit, a bit in the form of a carpenter's gouge, used for boring wood.

Gouge-Slip, oil-stone, or hone, with rounded edges, for sharpening gouges.

Goulard's Extract, a solution of acetate of lead, used as an external lotion.

Gourde, a name given to the colonial dollar in the West Indies, and in Louisiana to the American dollar.

Gourds, cucurbitaceous plants, several of which have commercial uses. The bottle or trumpet *G.*, and the colocynth *G.*, have already been mentioned. The squash *G.* (*Cucurbita melopepo*), and the common *G.*, or pumpkin (*C. pepo*), are agreeable culinary fruits, and used for making pies. The vegetable marrow is a variety of the common *G.* The very large Indian *G.* (*C. maxima*) is met with in gardens under the French name of *Potiron jaune*, and used in soups or mashed. The young fruit of the *G.* are used for pickles.

Goureau, a kind of long, violet-colored fig; Madona fig.

Gouze, a name in Bombay for the grain weight, used in weighing gold or silver; the 100th part of a tola.

Governor, one who directs.—That part of a steam-engine which regulates the supply of steam from the boiler to the cylinder, and insures the nearly uniform velocity of the piston. The mode in which this is accomplished may be seen in Fig. 241, which represents the favorite form of *G.* D is a vertical axis carrying the pulley, *l*, which receives a rotary motion from the driving-shaft of the engine, by a band not shown in the figure. Near the top of the axis, at *e*, two bent rods work on a pin, crossing each other in the same manner as the blades of a pair of scissors. The two heavy balls are attached to the lower arms of these levers, which move in slits through the curved guides intended to keep them always in the same vertical plane as the axis, D. The upper arms are jointed at B B to rods hinged at H H to a ring not attached to the axis, but allowing it to revolve freely

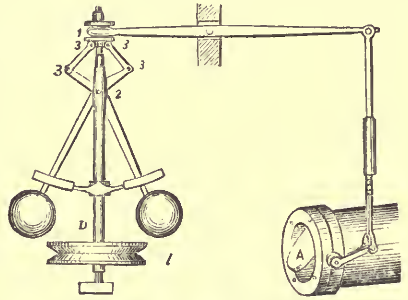


Fig. 241.—STEAM-ENGINE GOVERNOR.

within it. To this ring, at P, is fastened one end of the lever connected with the throttle-valve in a manner sufficiently obvious from the cut. The position represented is that assumed by the apparatus when the engine is in motion, the disk-valve, A, being partly open. If from any cause the velocity of the engine increases, the balls diverge from increased centrifugal force, and the effect is to draw down the ring at P, and, through the system of levers, to turn the disk in the direction of the arrows, and diminish the supply of steam. If, on the other hand, the speed of the engine is checked, the balls fall towards the axis, and the valve is opened wider, admitting steam more freely, and so restoring its former speed to the engine.

Gowland's Lotion, the essential oil of bitter almonds, mixed with sugar, spirits, and corrosive sublimate.

Gown, a woman's long outer garment.—A man's official loose robes, or dressing-wrapper.

Gown-Piece, enough material for a dress.

G. P. O., abbreviation for General Post-Office.

Grab, an implement varying in form, but essentially consisting of a pair of serrated jaws, used for withdrawing pipes, drills, etc., from artesian, oil, and other wells which are drilled, bored, or driven.

Grace. See DAYS OF GRACE.

Graddan, a kind of Scotch snuff.

Grade, quality, as different grades of flour, wheat, or coffee. See GRADIENT.

Gradient, Grade, the actual acclivity or declivity upon a railroad, which affects the speed at which a train can travel; as a *G.* of 3°, a *G.* of 42 feet per mile, a *G.* of 2 feet on 330.

Gradine, a toothed chisel used by sculptors.

Graduated Bottle, a bottle having horizontal marks, blown, pressed, or cut on its side, to indicate quantity of contents at given levels.

Graduation, the placing of measuring marks on an instrument of any kind, which often requires the highest refinement of mechanical art. A carpenter's rule, with the inches divided into eighths, may be taken as a type of such dividing or graduating as can be easily effected to the requisite degree of accuracy. A mural quadrant for an observatory, in which the $\frac{1}{100}$th part of an inch is regarded as a serious quantity, is the type of a wholly different kind, in which eyesight and mechanical delicacy are taxed to the utmost. The substances operated upon are box, larch, and one or two other kinds of wood, and ivory, brass, platinum, silver, gold, etc. In a few cases the *G.* marks are painted on the surface; but more usually they are engraved or incised. The more delicate *G.* are upon circles or portions of circles for quadrants, sextants, theodolites, transit instruments, equatorials, mural circles, rather than upon straight-line measurers. The graduator or divider is provided with pattern plates, rings, straight-edges, and other guides of similar kind. There are machines, called *dividing engines*, employed in the more delicate examples of *G.*, on which the utmost skill of such men as Ramsden, Troughton, Simms, and Ross has been displayed. Special *G.*, of great fame, are Froment's electro-divided lines, 25,000 to an inch; Nobert's lines on glass, 57,000 to an inch; and Whitworth's matchless micrometer, measuring a space of *one millionth of an inch!* The last named, however, measures by screw-threads, not by *G.*

Graduator, a vessel for accelerating the formation of vinegar by arrangements to diffuse the liquid over a large surface, so as to secure rapid acetification, in consequence of exposure to the air.

Graefenberg. See GERMANY (WINES OF).

Grafting, covering a rope by weaving together yarns.—The process of inserting a shoot or scion of one tree into the bark of another, to make it yield fruit.—Knitting new feet to stockings.

Grah, an Indian long measure; in Guzerat, the sixteenth part of the guz, and rather more than two inches.

Grailing. See COMB (MANUF. OF).

Grain, a single seed of any cereal plant which is used for food. This word, however, is more generally used collectively for the fruit or seed of cereal plants in general, as wheat, Indian corn, rye, barley, etc.; as a cargo of *G.*, a *G.*-market. The principal *G.*-markets in the world are Chicago, Buffalo, Odessa, Baltimore, Galatz and Braila, Archangel, Dantzic, St. Petersburg, Oswego, etc.

The smallest weight in common use in this country and England; the 7,000th part of a lb. avoirdupois, and the 5,760th part of a lb. troy; in apothecaries' weight the 20th part of a scruple; in troy weight the 24th part of the penny-weight. The grain for diamonds is only 0.79 gr. In France the grain for pearls is 0.80, and for precious stones, 0.79.

The direction of the fibres in wood and other fibrous substances.—The word is applied in dyeing to a thorough dye; as "goods dyed in the grain," which is to say, that the raw materials or fibres were dyed before manufacture.

Grain-Cleaner, a winnowing machine.

Grain-Dryer, a machine or contrivance, of which there are several kinds, for drying damp grain, or kiln-dry grain in sound condition, so as to fit it for ocean shipment. The *revolving-cup* dryer (Fig. 242) consists of a chamber filled with an ascending current of heated air. The grain, passing through a heated cone seen at top of the chamber, falls on a revolving flanged disk which

distributes it to be again collected by a hopper, fed to another cup, and so on down through to the discharge-spout.

Grained, painted in imitation of the grain or fibres of certain woods.

Grainer, a workman who ornaments wood-work with fancy devices; the brush with which he

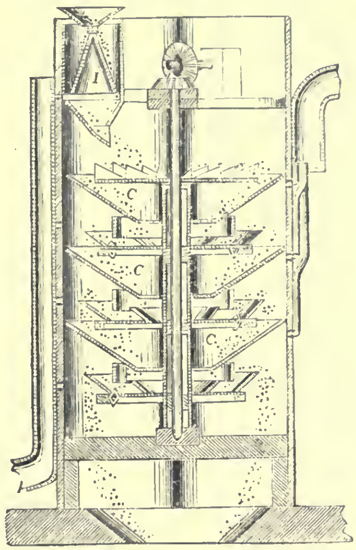


Fig. 242. — Grain-Dryer.

works. — An infusion of pigeons' dung in water, used for giving flexibility to skins in the process of tanning. — A knife used by tanners and skinners for taking off the hair from skins.

Graining, a process in tanning which consists in rubbing the leather on the flesh-side with a pommel, as to give it a granular appearance and render it supple. — A method of painting in which the grain or fibres of wood are imitated.

Grain-Leather, a name for dressed horse-hides. — Goat, seal, and other skins, blacked on the grain-side for women's shoes, etc.

Grains, the refuse or husks of malt from a brewery, or of any grain after distillation; usually purchased to feed cows and pigs with. — A kind of iron harpoon, with four or more barbed points to it, used for striking small fish.

Grains of Health [*grains de sante du docteur Franck*] are silvered pills, containing 1 part gamboge and 4 parts aloes.

Grains of Paradise, the aromatic pungent seeds of the Malaguetta pepper (*Amomum grana Paradisi*) obtained on the coast of Guinea; a spicy condiment, used in veterinary practice, and in the illegal preparation of malt liquors, etc. *Imp.* duty, 20 per cent.

Grain-Tin, crystalline tin ore; metallic tin, smelted with charcoal; the purest kind of metal, that reduced from the loose grains of tin stone.

Graip, a dung-fork; a tool for lifting or digging potatoes from the ground.

Graith [Sc.] the furniture of a house; accoutrements of a horse; apparatus of any kind; wearing apparel.

Gram, a common name in India for several kinds of pulse, the produce of varieties of *Dolichos* and *Phaseolus*.

Gramashes, garters reaching to the knees. — A kind of stockings worn in Scotland instead of boots.

Gramigna, a name in Italy for the long underground shoots of couch grass (*Triticum repens*), which is extensively collected after the plough and harrow, and used as food for horses.

Gramme, the proper unity of French weight, a cube of one hundredth of a mètre on a side, and equal to 15.4339 troy grains. The kilogramme, which is the weight of a cubic decimètre of pure water, is, however, practically used as the unity of weight in France.

Gramola [It.] an instrument for beating or bruising flax.

Gram-Pot, a boiler in which pulse is cooked by the natives in India.

Granada. See Nicaragua.

Granadilla, a climbing plant of the tropics, *Passiflora quadrangularis;* the subacid pulp of the fruit is esteemed, and the root is emetic and narcotic.

Granary, a warehouse or place where corn is stored.

Grande, in a sugar manuf., the largest evaporating pan of a battery.

Grand Haven R.R. runs from Allegan to Muskegon, Mich., 57.5 m. This Co., whose offices are in Allegan, was organized in 1869 as the Michigan Lake Shore R.R. Co. In 1873 it was placed in the hands of a receiver, and in 1878 it was sold under foreclosure and reorganized under its present title. *Financial statement:* Cap. stock, \$800,000; receiver's certificates, \$160,000; total, \$960,000.

Grand-Jury, the first or principal jury, to which is referred the examination of indictments against criminals.

Grand-Piano, a long piano-forte, shaped like a harpsichord.

Grand Rapids and Indiana R.R. runs from Fort Wayne, Ind., to Petoskey, Mich., 332 m. This Co., whose offices are in Grand Rapids, Mich., has leased for 99 years the Cincinnati, Richmond, and Fort Wayne R.R., 91.5 m. in length, guaranteeing interest on the bonds of that Co. It has also leased the Allegan & Southeastern R.R., 11.50 m., for the net profits of the line, and operates the Traverse City R.R., 26 m. in length, making a total of 461.1 m. under its control. *Financial statement:* Cap. stock, \$2,800,000; funded debt, \$8,000,000, as follows: 1st mortgage, land-grant bonds, guaranteed, issued 1869, \$4,000,000 payable 1899, interest 7 % (Jan. and July); 1st mortgage, land-grant bonds, unguaranteed, issued 1869, \$3,205,000, payable 1899, interest 7 % (April and Oct.); income bonds, issued 1875, \$795,000, payable 1906, interest 7 %. The Co. holds two land-grants amounting to 1,160,000 acres, of which 852,960 acres have been certified.

Grand Rapids, Newaygo, and Lake Shore R.R. runs from Grand Rapids to White Cloud, Mich., 46 m. This Co., whose offices are in Grand Rapids, was organized in 1869 and completed in 1875. *Financial statement:* Cap. stock, \$533,000.84; funded debt, \$776,000, as follows, — 1st mortgage, 8 % 20-year bonds, issued 1871, \$560,000; and 2d mortgage, 7 % bonds, payable in 1905, \$149,500 of which are held by the Co.

Grand River Valley R.R. runs from Jackson to Grand Rapids, Mich., 82.4 m. This Co., whose offices are in Jackson, Mich., was chartered in 1846, and the road, completed in 1870, is leased to the Michigan Central R.R. Co. Interest on its bonds and a dividend of 5 % on its paid-in stock

are paid by the Michigan Central. *Financial statement:* Cap. stock authorized, $1,000,000; paid in and guaranteed 5%, $492,000; funded debt, $1,500,000, as follows: 1st mortgage, 8% bonds (assumed by Michigan Central), $1,000,000, payable 1886; and 2d mortgage, 8% bonds (guaranteed by lessees), $500,000; total stock and bonds, $1,991,200. Cost of road, $2,840,031.

Grange, a farm having suitable barns, stables, and other necessary buildings for stock, etc.

Granilla, a small inferior variety of cochineal.

Granite, a plutonic or igneous rock, consisting of quartz, mica, and felspar. *G.* is one of the most valuable of building-stones. The hard, close-grained varieties are the most durable. It should be pure from pyrites or any ore of iron. By examining the rock in its native beds, good evidence can be obtained as to its durability. The more felspathic are less enduring than the quartzose, and the syenitic or hornblendic variety is the most durable. *G.* is capable of sustaining an immense pressure, which makes it peculiarly valuable for large works or buildings. Experiment has demonstrated that a weight of 24,556 lbs. is required to crush a half-inch cube of the best stone. *G.* abounds in New England. Excellent *G.* is quarried in Maine, Virginia, and New Hampshire, but the most celebrated quarries are in Massachusetts. The Quincy *G.* is properly a syenite. *G.* is detached in blocks of any length by drilling holes every few inches in the line of desired fracture, and driving in wedges of iron between steel *cheeks*, or half-round pieces fitting the sides of the hole. After removal the rock hardens somewhat, and is less easily cut than when first taken from the quarry. *Imp.* duty, $1.50 per ton; dressed or polished, 20 per cent.

Granulated, formed in small grains, as in sugar, grain tin, etc.

Granulation, the act or process of forming, or breaking into, grains or small masses.

Pharmacy. The *G.* of medicine has of late years received considerable attention from both foreign and American pharmaceutists. In France, granulated powders (*poudres granulées*) are coming into general use in place of impalpable powders, the most unpleasant of all forms of medicine. An English chemist has lately introduced the following method of granulating medicines: The powder to be granulated is placed in a mortar, and mucilage of gum acacia is gradually added until a crumbly mass is made; this is then rubbed through a wire sieve (about 12 meshes to the inch), and the granules produced are spread out on paper, and left to dry spontaneously, or they are placed in a copper pan, and kept in a constant motion over a stove until dry; when perfectly dry, they are placed in a mortar, and a sufficient quantity of strong tincture of tolu (3 dr. to 1 oz.) is added to them, until by constant stirring they all appear glossy and shining; they are then dried again by a gentle heat, being kept in constant motion. The granules thus formed keep well, are tasteless, and are much more elegant and agreeable preparations than pills or ordinary powders. Many saline substances are granulated by the simple process of dissolving the salt in water, and evaporating to dryness with constant stirring.

Metals are granulated (reduced to drops, grains, or coarse powder) by pouring them, in the melted state, into water. In many cases they are allowed to run through the holes of a species of colander or sieve to produce minute division; and in order to render the drops spherical, they are allowed to fall from a sufficient height to permit of their acquiring the solid state before striking the water. Lead shot is made in this way. Shot towers are often upwards of 100 feet in height.

Grapes [Fr. *raisins;* Ger. *Trauben;* It. *grapi, grappoli;* Port. *uvas;* Sp. *ubas*], the fruit of the grape-vine, *Vitis vinifera*, a tree with long slender branches, generally found indigenous in countries lying between 26° and 44° N. lat., and between 26° and 75° E. lon., but the growth of which in the open air has been extended by cultivation 10° on each side of that range. This fruit is made an object of attention chiefly in the countries of the S. of Europe, although in none have *G.* been produced equal to those of Syria, as regards the size of the berries and weight of the branches. *G.* are chiefly used in the manufacture of wine, but they are also extensively consumed as food, and in this country are a common article of the dessert. For the latter purpose they are mostly imported in a dried state (see RAISINS) from Spain and Turkey; while a small kind, much used in puddings (CURRANTS), are brought from the Ionian Islands and Greece. The only green *G.* imported to any extent into the U. States are the large solid Malaga *G.*, which are in large bunches. They are put up in sawdust and packed in casks. The most valuable *G.* grown in this country are from the Concord, Catawba, Delaware, and Norton's Virginia vines, which are natives of America. These *G.* are of a purple color, and have as luscious a taste as the best *G.* of Europe. See WINE.

Imp. duty, 20 per cent; juice or pulp, 25 per cent.

Grape-seed Oil, a yellow and slightly odorous oil, prepared from the seeds of the common grape by pressure. It has a mild taste when fresh, but becomes thick and rancid by age.

Grape-Sugar. Same as GLUCOSE.

Graphite. See PLUMBAGO.

Grapholite, a description of writing-slate.

Graphometer, a mathematical instrument for measuring angles.

Graphotype, a modern process of engraving which produces an effect somewhat similar to that of wood-engraving. It is an American invention, but is more used in England than in this country. It is described as follows: Finely powdered chalk is spread thickly on a metal plate, and then subjected to hydraulic pressure till it becomes a solid mass with a beautiful white surface, slightly shining, but not inconveniently brilliant. On this surface the artist draws in a glutinous ink, perfectly black, flowing from a finely pointed little brush; the pen cannot be used, on account of the friability of the chalk. The ink glues the particles of chalk where it passes, and when the drawing is complete the white spaces between the lines are easily hollowed by rubbing them gently with a piece of velvet or a light brush. The black lines remain in relief, like the lines of a woodcut. The plate is then dipped in a solution of flint, and so hardened, after which a stereotype cast or an electrotype copy is taken from it, and this is used as a stereotype or electrotype.

Grapnel. See ANCHOR.

Grapple, Grappling-Iron, a hook or crooked iron instrument used to seize and hold fast another vessel. — A grasping tongs, varying in shape in its various uses. The *G.* represented in Fig. 243 are employed for extracting obstructions from bored wells or shafts.

Grass-Cloth. See CHINA GRASS-CLOTH.

Grass Mats, door-mats made of Spanish or other kinds of grasses.

Grass-Oil, a name given to some essential oils obtained from scented grasses in India, as that from the lemon-grass, the grass-oil of Nemaur, etc. It is sometimes called ginger-grass oil.

Grass-Plot, a lawn of trimmed grass.

Grass-Tree, a name in Australia for some liliaceous plants, species of *Xanthorrhœa*, from which a resin is obtained, known in commerce as gum acroides.

Grate, a frame of iron bars used for burning coal as fuel. In the construction of a grate it is desirable to make the perpendicular height of the fuel as great as is consistent with safety. A stra-

tum of burning coal will radiate considerably more heat into an apartment if placed vertically than if arranged horizontally; besides which, a great saving of fuel will be effected in proportion to the heat radiated.

Grater, a rubbing or scratching utensil of iron, having a rasping surface, for domestic use, as a nutmeg *G.*, arrowroot *G.*, raspers, etc. — Also, in book-binding, an iron tool for rubbing the backs of sewed books after pasting.

Graticulation, the division of a drawing into squares.

Grating, an open lattice-work of wood or iron — A cross-barred covering for the hatchways of a ship.

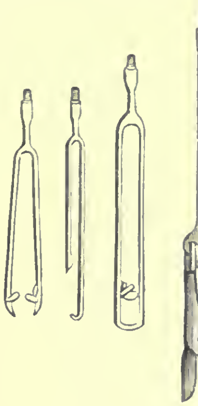


Fig. 243. — Grapple.

Gratis, without charge, fee, or recompense; for nothing.

Gravecembalo, a harpsichord.

Gravel, a collective name for pebbles, small pieces of rock that have become rounded by attrition. They may be as small as a pea, or as large as an egg, and may comprise different kinds of stone. *G.* is much used in making concrete and artificial stone.

Graver, an engraver's burin, or square piece of steel fixed in a handle, and bevelled diagonally at the end. — An instrument used for turning iron, after it has been roughed out by the "heel-tool."

Graves. See Claret Wines.

Gravières. See Burgundy Wines.

Gravimeter, an instrument for measuring the specific gravity of bodies. See Hydrometer.

Graving-Dock See Dock.

Gravity, the attractive force by which bodies fall towards the centre of the earth. Weight is the measure of gravity.

Specific Gravity is the comparative density of various substances; it affords the means of readily determining the bulk from the known weight, or the weight from the known bulk; and this will be found more especially useful in cases where the substance is too large to admit of being weighed, or too irregular in shape to allow of correct measurement. The standard with which all solids and liquids are thus compared is that of distilled water, one cubic foot of which weighs 1000 oz avoirdupois; and the sp. gr. of a *solid* body is determined by the difference between its weight in the air and in water. Thus, if the body be *heavier* than water, it will displace a quantity of liquid equal to it in *bulk*, and will lose as much weight on immersion as that of an equal bulk of the fluid Let it be weighed first, therefore, in the air, and then in water, and its weight in the air be divided by the difference between the two weights, and the quotient will be its sp gr., that of water being unity. *Example.* A piece of copper ore weighs 56¼ oz in the air, and 43¾ oz in water; required its sp. gr.

56.25 — 43 75 = 12.5, and 56 25 ÷ 12.5 = 4.5, the sp. gr.

If the body be *lighter* than water, it will float, and displace a quantity of fluid equal to it in *weight*, the bulk of which will be equal to that only of the part immersed. A heavier substance must therefore be attached to it, so that the two may sink in the fluid. Then the weight of the lighter substance in the air must be added to that of the heavier substance in water, and the weight of both united, in water, be subtracted from the sum; the weight of the lighter body in the air must then be divided by the difference, and the quotient will be the sp. gr. of the lighter substance required. *Example* A piece of fir weighs 40 oz in the air, and, being immersed in water attached to a piece of iron weighing 31 oz., the *two* together are found to weigh 3 3 oz. in water, and the iron alone 25.8 oz in the water: required the sp. gr. of the wood

40 + 25 8 = 65 8 — 3.3 = 62.5; and 40 ÷ 62.5 = 0.61, the sp gr. of the fir.

The sp. gr of a *fluid* may be determined by taking a solid body, heavy enough to sink in the fluid, and of known sp. gr., and weighing it both in the air and in the fluid. The difference between the two weights must be multiplied by the sp. gr. of the solid body, and the product divided by the weight of the solid in the air; the quotient will be the sp. gr of the fluid, that of water being unity. *Example* Required the sp. gr of a given mixture of muriatic acid and water; a piece of glass, the sp. gr of which is 3., weighing 3¾ oz. when immersed in it, and 6 oz. in the air.

6 — 3 75 = 2 25 × 3 = 6.75 ÷ 6 = 1.125, the sp gr.

Since the weight of a cubic foot of distilled water, at the temperature of 60° F., has been ascertained to be 1000 avoirdupois oz., it follows that the sp gr. of all bodies compared with it may be made to express the weight, in oz., of a cubic foot of each, by multiplying these sp gr. (compared with that of water as unity) by 1000. Thus, that of water being 1, and that of silver, as compared with it, being 10.474, the multiplication of each by 1000 will give 1000 oz. for the cubic foot of water, and 10474 oz. for the cubic foot of silver. See Hydrometer.

Table of Specific Gravities. — Water = 1000.

Metals.		*Inorganic Non-Metallic Bodies.*	
Antimony	6.712	Agate	2.590
Zinc	7.190	Amber	1.078
Cast-iron	7.207	Sulphur	2.033
Tin	7.291	Crown-glass	2.488
Steel	7.816	Flint-glass	3.329
Cast copper	8.788	Rock-crystal	2.653
Bismuth	9.882	Diamonds	3.501
Silver	10.474		
Lead	11.352		
Gold	19.258		
Platinum	20 337	*Liquids.*	
Mercury	13.586	Ether	0.715
Organic Bodies.		Alcohol	0.792
		Oil of turpentine	0.870
Oak wood	0.925	Sea-water	1.026
Cork	0.240	Milk	1.030
Ivory	1.826	Nitric acid	1.503
White wax	0.960	Sulphuric acid	1.845

Gravy-Dish, a large table-dish for a joint, with a well for gravy.

Gravy-Spoon, a large spoon used at table for helping gravy to guests.

Gravy-Strainer, a small wire or hair sieve, used for culinary purposes.

Gray, a color, which is white with a mixture of black; ash-colored. The term is also applied to fabrics of cotton, linen, or worsted, or to mixed fabrics of these materials, in the state in which they come from the loom or spindle, and before they are bleached or colored.

Gray Goods, cotton fabrics woven in the gray and known as printing cloths.

Grazier, one who rears or feeds stock; a cattle-dealer.

Grease, a general name for animal fat of any kind. — Melted tallow, with soda, palm-oil, and water, used as a lubricator for the axles of railroad cars.

Imp Duty. All not specified, 10 per cent; for use as soap-stock only, not otherwise specified, free; known as *brown grease*, obtained by pressure from wool-skins, as animal oils, 20 per cent.

Grease-Box, the receptacle over the axle of a railroad car holding grease; also the portable box in which grease is carried to replenish the above.

Grease-Cock, a short pipe fixed in the cylinder cover of a steam-engine, with two stopcocks inserted at a short distance apart, and a funnel at the top for holding tallow. When the upper cock is opened, the tallow falls into the intermediate space; the cock is then closed, and the lower one opened for the melted grease to enter the cylinder, and lubricate the piston without allowing the steam to escape.

Great Britain and Ireland, a powerful state of Western Europe, which consists of the *Island of Great Britain*, including England, Wales, and Scotland, and the *British Islands*, including Ireland, the Scilly Islands, the Channel Islands, Man, Bute,

Arran, the Hebrides, Orkney, and Shetland Islands. In the above limits it is styled *The United Kingdom of Great Britain and Ireland*, and for the sake of shortness *Great Britain;* while with its colonies and dependencies it constitutes the *British Empire.* The immense area and population of the British Empire were, in 1878, distributed as follows: —

Countries.	Area in Sq. miles.	Population.
United Kingdom	121,608	34,160,000
India and Ceylon	933,673	193,725,180
Colonies and Dominions	7,208,322	11,587,360
Total British Empire	8,263,603	249,472,540
Tributary States in India	558,724	48,236,200
Total Empire and tributary States.	8,822,327	297,708,740

The government of the British Empire is a constitutional hereditary monarchy. The supreme legislative power of the British Empire is by its constitution given to Parliament. "The power and jurisdiction of Parliament," says Sir Edward Coke, "is so transcendent and absolute that it cannot be confined, either for causes or persons, within any bounds." And, repeating the words, Sir William Blackstone adds, that it is "the place where that absolute despotic power, which must in all governments reside somewhere, is entrusted by the constitution of these kingdoms." The sovereign is not only the head, but also the beginning and the end — *caput, principium, et finis* — of Parliament; he alone can summon Parliament; and no Parliament, save on the demise of a sovereign, can assemble of its own accord. Parliament is summoned by the writ of the sovereign issued out of Chancery, by advice of the privy council, at least thirty-five days previous to its assembling. Act 16 Chas. II., provides that Parliament shall not in future be intermitted for above 3 years at the most, but as the supplies are only granted for a year, the Crown, since the Revolution, is compelled to summon a Parliament annually. By ancient right and usage, lying at the foundation of the constitution, the House of Commons has the exclusive control over taxation, and at its will may grant or refuse supplies to the Crown. It has become customary of late for Parliaments to meet in annual session extending over the first six months of the year. Every session must end with a prorogation, and by it all bills which have not been passed fall to the ground. The prorogation takes place either by the sovereign in person, or by commission from the Crown, or by proclamation. Both houses of legislature must be prorogued at the same time. The present form of Parliament, as divided into two houses of legislature, the Lords and the Commons, dates from the time of Edward II. The *Upper House* consists of peers who hold their seats: 1. By virtue of hereditary right; 2. By creation of the sovereign; 3. By virtue of office, — English bishops; 4. By election for life, — Irish peers; 5. By election for duration of Parliament, — Scottish peers. The Crown is unrestricted in its power of creating peers, and the privilege has been largely used by modern governments to fill the House of Lords, which, in the session of 1878, consisted of 538 members. The *Lower House* of legislature, representing, in constitutional theory, all the "Commons of England," has consisted, since 49 Hen. III., of knights of the shire, or representatives of counties; of citizens, or representatives of cities; and of burgesses, or representatives of boroughs; all of whom indistinctly vote together. In 1878 there were in the United Kingdom 2,952,005 voters, and in the session of that year the House of Commons numbered 650 members. The powers of Parliament are politically omnipotent within the United Kingdom and its colonies and dependencies. It can make new laws, and enlarge, alter, or repeal those existing. The parliamentary authority extends to all ecclesiastical, temporal, civil, or military matters, as well as to altering or changing the constitution of the realm. Parliament is the highest Court of Law, over which no other has jurisdiction. The *executive government* is vested nominally in the Crown; but practically in a committee of ministers, commonly called the *Cabinet*, which has come to absorb the function of the ancient Privy Council, or "the King in Council," the members of which, bearing the title of Right Honorable, are sworn "to advise the king according to the best of their cunning and discretion," and "to help and strengthen the execution of what shall be resolved." Though not the offspring of any formal election, the Cabinet is virtually appointed by Parliament, and more especially by the House of Commons, its existence being dependent on the possession of a majority in the latter assembly. The member of the Cabinet who fills the position of First Lord of the Treasury is the chief of the ministry, and therefore of the Cabinet. It is at his recommendation that his colleagues are appointed; and he dispenses, with hardly an exception, the patronage of the Crown. Every Cabinet includes the following nine members of the administration: the First Lord of the Treasury, the Lord Chancellor, the Lord President of the Council, the Chancellor of the Exchequer, and the five Secretaries of State. A number of other ministerial functionaries, varying from two to eight, have usually seats in the Cabinet, those most frequently admitted being the Lord Privy Seal, the First Lord of the Admiralty, the President of the Board of Trade, the Vice-President of the Committee of Council on Education, the Postmaster-General, the Chief Secretary for Ireland, and the President of the Local Government Board. The selection usually falls upon those amongst the last-mentioned functionaries whose rank, talents, reputation, and political weight render them the most useful auxiliaries, or whose services, while in opposition, may have created the strongest claims to become members of the Cabinet. It has occasionally happened that a statesman possessing high character and influence accepted a seat in the Cabinet without undertaking the labors and responsibilities of any particular office. Although the Cabinet has been regarded during several generations as an essential part of the institutions of Great Britain, yet it continues to be unknown to the law. The names of the members who compose it are never officially announced; no record is kept of its resolutions or meetings, nor has its existence been recognized by Act of Parliament. — The political divisions of England, Scotland, and Ireland are given below in their respective chapters. London, the capital of the United Kingdom, and the largest city in the world, had in 1878 a population of 3,533,484. London is at the present day what New York will become in the next century — the emporium of the commerce of the world. To attempt a description of its multifarious branches of industry and commerce would require more space than we have at our command, and would, besides, necessitate repetition, almost every im-

portant article on commerce in this work referring to the commerce of London or England. In the following pages, after short notices on the physical geography of England, Scotland, and Ireland, are given the commercial and financial statistics of Great Britain which have found no room in other parts of the work, and a synopsis of her principal seaports.

I. England.

England, comprising with Wales the southern portion of the island of Great Britain, extends from lat. 49° 48′ to 55° 45′ N., and from lon. 1° 45′ E. to 5° 44′ W.; area 58.320 sq. m. In shape it is nearly triangular; and, owing to its being surrounded by the sea on all sides, except for a distance of about 70 m. on the Scottish border, it has a most extensive coast-line. The seas which encircle it are the German Ocean, or North Sea, on the E., and the Atlantic Ocean on the W. and S., the latter receiving in some of its parts the names of the Irish or St. George's Channel, and of the English Channel. The coast is much indented, more particularly on the Atlantic side, the total length following the indentation being estimated at over 2,000 m. There are few countries more diversified in physical structure, or in soil, climate, and natural scenery, than England. As regards physical structure, it has been truly described to be in itself an "epitome of the geology of almost the whole of Europe." Nearly all the formations of the earth's crust, from the Silurian upwards to the most recent, are to be found, in layers more or less thick, in different parts of England. The mountains of England lie in the N. and W., falling into undulating ground in the centre and towards the S., and leaving the eastern districts, bordered by the German Ocean, a uniform plain. They may be looked upon as one principal chain, often interrupted, however, and with endless ramifications, stretching from the Scottish border, in Northumberland, down to the W. end of Cornwall, jutting out there into the Atlantic. The chain, traced in this direction, commences with the Cheviot Hills, the highest summit of which is Cheviot Peak, in Northumberland, 2,676 feet above sea. Stretching S. W., the chain next merges into the mountain ranges of Cumberland and Westmoreland, comprising Skiddaw, 3,022 feet, Helvellyn, 3,118 feet, and Scawfell, 3,208 feet, above sea. Within these ranges lie the only notable lakes of England, the largest of which, however, Windermere, does not cover more than 3 sq. m. After sending out numerous branches eastwards into the county of York, the chain sinks to modest elevations in Lancashire and Cheshire, but rises again in Wales, where it attains its greatest height in the summit of Wyddva, the pinnacle of the Snowdon range, 3,571 feet above sea. Partly lost in the Bristol Channel, and partly ramifying through Gloucestershire, Wilts, and Somerset, the chain next rises into high table-land in Devonshire, — Dartmoor Forest, averaging an elevation of 1,500 feet above sea, forming its most elevated portion. The chain gradually declines from Dartmoor to the Land's End, and becomes also more contracted in that direction. From the Dunkerry Beacon, on Exmoor, 1,668 feet above sea, the mountain range goes sinking on to Carnwarth, in Cornwall, 849 feet; to Cara Brea, 697 feet; and, finally, to the famous headland of Bolerium, the granite masses of which oppose the ever-surging waters of the Atlantic, but rise only about 60 feet above them. — *Rivers.* As the mountainous regions are in the W., the principal rivers flow away from them, towards the E., with but few exceptions. Surrounded by the sea, and with a moist atmosphere, England has a comparatively large number of rivers, though none of them of great length, their course being in most instances the shortest allowed by the configuration of the island. At the head of English rivers, with acknowledged supremacy over the rest, stands the *Thames.* It drains an area of 6,160 sq. m, exclusive of its lower estuary, calculated to embrace an additional drainage of about 4,000 sq. m. Next. in extent of area of drainage, come the *Trent* and *Ouse*, the joint waters of which form the *Humber*, carrying off the rainfall from 9.550 sq. m of land, or about one sixth of the whole of England. The *Witham*, the *Welland*, the *Nen*, and their tributaries, flowing into the old estuary of the Wash, drain together an area of 5 850 sq. m. In comparison with the drainage area of these rivers, running principally from E. to W., that of currents following an opposite direction is small; but several of them are nevertheless of great commercial and industrial importance. Foremost among these westerly flowing rivers stands the *Severn*, the source of which is only a short distance from that of the Thames, the watershed being

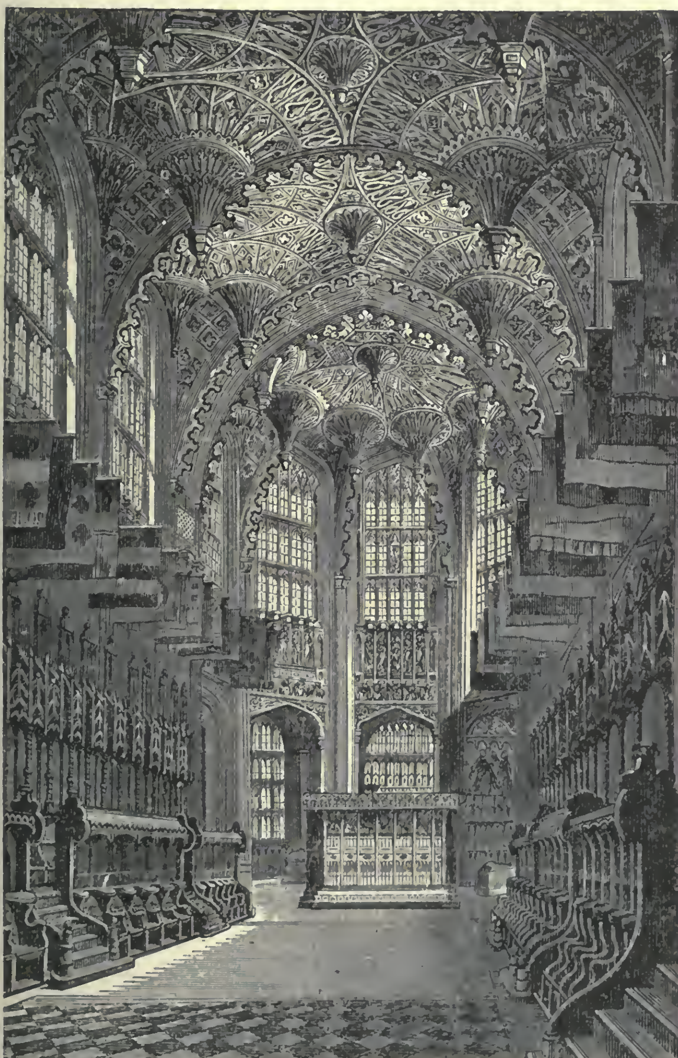


Fig. 244. — Westminster Abbey.

formed here by the narrow oölitic escarpment of the Cotswold hills. The Severn drains an area of 8,580 sq. m., being more than that of all the other westward-running rivers together. Next to it stand the *Mersey*, which, with its sea-estuary, drains 1,750 sq. m., the *Avon*, which drains 1,210 sq. m., and the *Eden*, which drains 995 sq. m. of land. In Camden's *Britannia*, published in 1605, there is a list enumerating 553 rivers and streams, with separate names, in England and Wales; but it cannot be said that there are, at the utmost, more than fifty rivers that can properly be described as navigable. The former importance of the rivers of England, connected with each other by a vast network of canals, for inland navigation, has suffered much since the introduction of railways; still they continue of great benefit for cheap, if slow, communication. Of the highest commercial value still are the Thames, the Humber, the Mersey, and the Severn, but these four principal English rivers derive their importance mainly, if not entirely, from being arms of the sea. — *Climate.* Affected by its insular position, with no part of its land more than 100 m. from the sea, and perhaps equally as much — though modern scientific investigation has not quite set this matter at rest — by that most remarkable current of the ocean known as the Gulf Stream, the climate of England is much milder than that of any other country in the same latitude on the continent of Europe or in America. The mean annual temperature of England in recent years has been 49.7°,— that of summer averaging 60.8°, and that of winter 39.5°. The principal cause of this very high as well as very equable temperature, contrasting to a marvellous extent with that of other countries in like latitude, such as, for example, Northern Canada, is generally ascribed, with but few dissenting opinions, to the constant flow of heated water bathing the W. shore of the island. The vast current of the Gulf Stream, originating within the landlocked area of the Gulf of Mexico, where the tropical sun is heating the waters as in an immense caldron, after running for some distance E. into the open ocean, then turns direct to the N. E., so that the first land it meets with, and which feels its effect, is the shores of Ireland and England. The actual amount of heat so given to England must be enormous, since the temperature of the Gulf Stream is at least 8° above that of the surrounding waters of the North Atlantic. A recent scientific traveller, making experiments in a voyage from England to the U. States, found that, while in the Gulf Stream the water was at sunrise always not less than 4° above the temperature of the air, by a sudden change, on quitting the N. E. current, the temperature of the waves was found to be, on the average, 4° below that of the air. England is thus in the position of a great hot-house, kept above the surrounding temperature by never-ending currents of warm air. But it is not warmth alone, but moisture, which the Gulf Stream gives to England. Here, as in the greater part of W. Europe, the prevailing winds are from the S. W., bringing with them the warm, moist air of the great Atlantic current, and discharging it in rainfall all over the land. This is strikingly shown in the statistics of rainfall in England, which prove it far higher in the W. than in the E. counties, and greatest in those parts where the moist Atlantic air-currents are unimpeded by mountain ranges. In the extreme S. W., in Cornwall, from 22 to 47 inches of rain fall every year, and the average may be taken at 36 inches; while in the adjoining county, Devonshire, a little further inland, the average is but 32 inches. However, the high range of the Dartmoor hills causes a much greater variation in the amount of rainfall in the latter county than in the former; for while no less than 52.33 inches fall on the summit of Dartmoor, only 19.87 inches fall at Sidmouth, lying sheltered to the W. The same is the case farther E., in Somersetshire, where 36.76 inches of rain fall annually at West Harptree, facing the Bristol Channel, while only 19 inches fall at Taunton, shut off from the moist gulf current by the Exmoor range. So it is everywhere all over England, with the general result that in the W., and more especially the S. parts of it, there is more rainfall than in the E., the variations also being much less in the latter districts. In the metropolitan counties of Middlesex, Kent, and Surrey the variations are no greater than from 16.22 inches at Hampstead to 28.90 inches at Cranbrook. The highest rainfall anywhere yet ascertained in England and Wales was at Beddgelert, Carnarvonshire, where it reached the enormous amount of 101.58 inches in the year 1870. Lying on the W. slope of the highest summit of the Snowdon range, close to the Atlantic, the little village received a surcharge of the moist air of the Gulf Stream. — *Soil.* Co-operating in their influence, climate and geological formation have given England a soil moderately fertile, yet adapted on the whole more for pasturage than for agriculture. In Wales, and other parts of N. and W. England through which stretch the principal mountain ranges, the Silurian rocks, covered on their upper surface chiefly with hard gritty and slaty material, difficult to decompose by atmospheric action, form but little soil, so that the ground must to a large extent remain untilled, leaving it at the same time well adapted for pastoral purposes. Again, through the inland counties, from Northumberland to Derbyshire, there runs another long tract of hilly country, composed of carboniferous rocks, so constituted as to be unfit for ordinary agriculture, except where intersected by stream-fed valleys. Further E. come the bleak moorlands of Yorkshire, which, barren in their nature, are being surrounded and intersected by some of the most fertile tracts in England, extremely well cultivated and thickly inhabited On the whole, it may be said that while much of the high-lying ground is fit only for pastoral purposes, the low lands are more or less fertile, the extreme moisture of the air having caused the complete disintegration even of such old geological formations as those of the Red Sandstone. It is a somewhat singular fact that nearly all the districts of England, where fruit-trees are grown in large quantities, lie chiefly upon red rocks, sometimes of the Old and sometimes of the New Sandstone strata. There cannot be a doubt, however, that, on the whole, the soil of England would be very barren, repaying poorly the labors of the husbandman, but for the vast cover of warmth and moisture received from the waters of the Atlantic, which favors it as the sun of more S. regions, and makes its fauna and flora equal to those of any country in the temperate zone. — *Civil divisions and population.* The physical aspect of England has had little to do with its civil divisions, which are somewhat arbitrary, and remote in their origin. The division of the country into tithings, hundreds, and counties is generally attributed to King Alfred, but it is more probable that he only systematized what already existed, in the general survey which was taken during his reign. English county names occur in history before the extinction of the Heptarchy, some of the smaller kingdoms of which, as Kent, Sussex, and Essex, became counties under the new political settlement. At the same time the Kingdom of Wessex was composed of counties with still existing names, — Berkshire, Hampshire, Wiltshire, and Somersetshire. The following table shows the area, inhabited houses, and population of the counties into which England and Wales are actually divided: —

Counties or Shires.	Area in Statute Acres.	Inhabited Houses, 1871.	Population.	
			1861.	1871.
ENGLAND.				
Bedford............	295,582	30,506	135,287	146,257
Berks..............	451.210	39,638	176.256	196,475
Buckingham	466,932	37,257	167,993	175,879
Cambridge.........	525,182	40,272	176,016	186,906
Chester............	707,078	110,449	505,428	561,201
Cornwall...........	873,600	73,950	369,390	362,343
Cumberland........	1,001.273	44,061	205,276	220,253
Derby	658,803	78,309	339,327	379,394
Devon	1,657,180	105,200	584,373	601,374
Dorset.............	632,025	39,410	188,789	195,537
Durham............	622,476	114,705	508.666	685,089
Essex..............	1,060,549	92,356	404,851	466,436
Gloucester.........	805,102	101,407	485.770	534,640
Hereford	534,823	26,371	123,712	125,370
Hertford...........	391,141	39,056	173,280	192,226
Huntingdon	229,544	14,032	64,250	63,708
Kent..............	1,0 9,419	151,344	733,887	848,294
Lancaster..........	1,219.221	530,490	2,429,440	2,819,495
Leicester...........	514,164	58,606	237,412	269,311
Lincoln............	1,775,457	94,212	412,246	436,599
Middlesex..........	180,136	321,229	2,206,485	2,539,765
Monmouth.........	368,399	36,169	174,633	195,448
Norfolk............	1,354,301	99,428	484,798	438,656
Northampton	630,358	52,539	227,704	243,891
Northumberland....	1,249,299	62,436	343,025	386.646
Nottingham	526,076	68,419	273,867	319,758
Oxford.............	472,717	37,849	170,944	177.975
Rutland............	95,805	4,766	21,861	22,073
Salop..............	826,055	50,804	240,959	248,111
Somerset	1,047,220	92,205	444,873	463,483
Southampton.......	1,070,216	98,283	481.815	544,684
Stafford	728,468	167,614	746,943	858,326
Suffolk.............	947,681	76,501	337,070	348.869
Surrey.............	478.792	168,443	831,093	1,090,635
Sussex.............	936,911	75,385	363,735	417.456
Warwick...........	563,946	131,442	561,853	634,189
Westmoreland	485,432	12,671	60,817	65,010
Wilts..............	865,092	54,874	249,311	257,177
Worcester..........	472,165	69,988	307,397	338,837
York..............	3,830,567	500,397	2,033,610	2,395,569
Total of England.	32,590,397	4,009,783	18,954,444	21,495,131
WALES.				
Anglesey...........	193,453	12,170	54,609	51 040
Brecon	460,158	12,647	61.627	59,901
Cardigan...........	443.387	16,420	72,245	73,441
Carmarthen........	606,331	24,333	111,796	116,710
Carnarvon.........	370.273	23,298	95.694	106,121
Denbigh	386,052	22,500	100,778	105 102
Flint..............	184,905	16.636	69.737	76,312
Glamorgan	547,494	72,905	317,752	397,859
Merioneth	385,291	10 006	38,963	46.598
Montgomery	483,323	13,911	36.919	67,623
Pembroke..........	401,691	19.583	96,278	91,998
Radnor	272,128	4,925	25,382	25,430
Total of Wales ...	4,734.436	249,334	1,111,780	1,217.135
Total of England and Wales....	37,324,883	4,259,117	23,066,224	22,712,266

England and Wales, taken by themselves, are more densely populated than any other country in Europe, except Belgium. On an area of 58,320 sq. m , or 37,324.883 acres, there lived in 1871, according to the census, 22,712,266 inhabitants, or 389 individuals per sq m. The population was as follows at the 8 enumerations, 1801 to 1871: —

Date of Enumeration.	Population.		
	Males.	Females.	Total.
1801, March 10th......	4,254,735	4,637,801	8,892,536
1811, May 27th......	4,873,605	5,290,651	10,164,256
1821, May 28th......	5,850,319	6,149,917	12,000,236
1831, May 29th......	6,771,196	7,125,601	13,896,797
1841, June 7th......	7,777,586	8,136,562	15,914,148
1851, March 31st......	8,781,225	9,146,384	17,927,609
1861, April 8th......	9,776,259	10,289,965	20,066,224
1871, April 3d	11,058,934	11,653,332	22,712,266

At the beginning of 1878 the 13 largest towns in England and Wales, each with over 100,000 inhabitants, were as follows, according to the estimates of the registrar-general, based upon the returns of births and deaths: London, 3,533,484 inhabitants; Liverpool, 527,083; Manchester, with Salford, 500,397; Birmingham, 377,436; Leeds, 291,580; Sheffield, 274,914; Bristol, 199,539; Bradford, 173,723; Newcastle-on-Tyne, 139,929; Hull, 136,933; Portsmouth, 124,867; Leicester, 113,581; and Sunderland, 108,343 inhabitants. One fourth of the total urban population of England and Wales live in London, and not far from one third live in 18 large cities and towns, selected by the registrar-general for the publication of weekly rates of mortality. The following is a list of these 18 towns, all of them containing over 60,000 inhabitants, with their population at the censuses of 1861 and 1871, and the rate of increase per cent during the decennial period.

Cities and Towns.	1861, April 8.	1871, April 3.	Rate of Increase per cent.
London....................	2,803,989	3,254,260	16.1
Liverpool..................	443,938	493,405	11.1
Manchester................	338,722	351,189	3 7
Salford	102,449	124,801	21.8
Birmingham...............	296,076	343,787	16 1
Leeds......................	207,165	259,212	25 1
Sheffield..................	185,172	239,946	29.6
Bristol	154,093	182,552	18.5
Bradford	106,218	145,830	37.3
Newcastle-on-Tyne.........	109,108	128,443	17 7
Hull	97,661	121,892	24 8
Portsmouth	94,799	113,569	19.8
Sunderland................	78,211	98,242	25.6
Leicester..................	68,056	95,220	40.0
Nottingham................	74,693	86,621	16.0
Oldham....................	72,333	82,629	14.2
Norwich...................	74,891	80,386	7.3
Wolverhampton............	60,860	68,291	12.2
Total....................	5,368,434	6,270,275	16.8

In 1878 the number of paupers, *exclusive of vagrants and casual poor*, in receipt of relief in the several unions and parishes, constituted under boards of guardians in England and Wales, amounted to 742,703 During the same year the number of criminal offenders committed for trial was as follows: men, 12,536; women, 3,354; total, 15,890. Convicted, 11,942

Subjoined is the birth, death, and marriage rate of the population of England and Wales for the 15 years from 1863 to 1877, with the estimated population for the middle of each year: —

Years.	Estimated Population.	Births.	Deaths.	Marriages.
1863	20,590,356	729,399	473,837	173.510
1864	20,834,496	740,275	495,531	180,387
1865	21,085,139	747,870	490,909	185,474
1866	21,342,864	753,870	500,689	187,776
1867	21,608,286	768 349	471,073	179,154
1868	21,882,059	786,156	480,622	176,962
1869	22,164,847	772,877	495,086	175,629
1870	22,457,366	792.129	515,544	181,655
1871	22,760,359	797,428	514,879	190,112
1872	23,067,385	825,907	492,065	201,267
1873	23,356,414	829.778	492,520	205,615
1874	23,648,609	854.956	526,632	202,010
1875	23,944,459	850,187	546.317	201.212
1876	24,244,010	887.968	510.315	201,874
1877	24,547,309	887,055	500,348	194,343

The proportion of male to female children born in England is as 104,811 to 100,000; but emigration, war, and perilous male occupations modify this proportion in 10 years to the extent that there are 100,000 women, of all ages, to 94,000 men in England.

Agriculture. The returns published by the government in the New Domesday Book show that in the year 1873 there were in England and Wales 972,836 owners of land, holding together 23,013,515 acres, of a gross estimated rental of £99,382,301. The subjoined table exhibits the number of land-owners, under thirteen classifications of ownership, the total extent of lands held by each class, and the gross estimated rental: —

Classification of Ownership.	Number.	Extent of Lands in Acres.	Gross Estimated Rental.
			£
Less than one acre...........	703,289	151,172	29,127,679
1 acre and under 10	121,983	478,680	6,438,325
10 acres and " 50	72,640	1,750,080	6,509,290
50 " " 100	25.839	1,791,606	4,302,003
100 " " 500	32.317	6,827,347	13,680.760
500 " " 1,000	4,799	3,317.678	6.427,552
1,000 " " 2.000	2,719	3,799,307	7,914,371
2,000 " " 5,000	1,815	5,529,190	9,579,312
5,000 " " 10,000	581	3,974,725	5.522,610
10,000 " " 20,000	223	3,098,675	4,337,023
20,000 " " 50,000	66	1,917,076	2,331.303
50,000 " " 100,000	3	194,939	188,746
100,000 and upwards.........	1	181,616	161,874
Areas not specified...........	6,448	......	2,831,453
Rentals not specified.........	113	1,424	....
Total of England and Wales (exclusive of the Metropolis)......................	972,836	33,013,515	99,352,301

Of the total area of England and Wales, comprising 37,324,883 statute acres, no less than 4,311,368 are not accounted for in the foregoing returns. These must consist partly of waste spaces, moorlands, and other areas, including that of the metropolis and crown property, intentionally set aside; and partly of lakes, rivers, and roads. This leaves perhaps a million or more of acres wanting, through great errors and omissions in the parish lists on which the returns were based. Still, with all these imperfections, and the undoubted miscalculations in the rental values, generally admitted to be large under-statements, enough remains to give a fair idea of the division of landed property in England and Wales. One of the most notable features of the returns is the fact that the number of land-owners possessed of less than one acre is as high as 703,289, being 73 3 per cent of the whole. The great decrease seen in the number of those who possess from one acre to ten being considerably under one fifth of the first class, is remarkable; and no less so is it that there are more land-owners who possess from 100 to 500 acres than who possess from 50 to 100 acres. The total number of land-owners in England and Wales is altogether, according to these returns, very far above what was formerly believed, for in the census returns of 1861 the number of "landed proprietors" was given at 30,766, and in those of 1871 at 22,964. But while it is seen that real property is so widely distributed, there appears not the less, from the Blue-Book of 1878, the all-important fact that the proprietors of over 5,000 acres, who deserve, more especially, the title of "great" land-owners, 874 in number, hold 9,367,031 acres, or more than one fourth of the country. The owners of 1,000 acres and upwards, numbering 5,408, hold 18,695,528 acres, being more than one half of the country; and those of 500 acres and upwards, 10,207 in number, hold 22,013,206 acres, or *two thirds of the whole of England and Wales.* These 10,207 owners well deserve the old title of the "upper ten thousand." The following proprietors outside the metropolis are returned in 1873 as either holding upwards of 50,000 acres, or having estimated rentals exceeding £100,000 per annum: —

Proprietor.	County.	Acres.	Rental.
			£
Duke of Northumberland	Northumberland ..	181,616	161,874
Duke of Devonshire..	Derby, York (W. R), Lancaster, Sussex..	126,904	127,633
Sir W.W.Wynn, Bart.	Denbigh, Montgomery, Merioneth....	87,256	42.882
Duke of Cleveland.....	Durham, Salop	81,441	61,824
Earl of Carlisle.......	Cumberland, Northumberland, York (N R.)...........	78,540	49,601
Duke of Bedford.....	Bedford, Cambridge, Devon............	74,996	127,653
Earl of Lonsdale.....	Westmoreland, Cumberland	67,457	69,959

Proprietor.	County.	Acres.	Rental, in £.
Earl of Powis	Montgomery, Salop	60,531	62,694
Duke of Rutland	Leicester, Derby	57,082	70,998
Earl of Derby	Lancaster, Derby	56,471	163,195
Earl of Yarborough	Lincoln	55,272	76,226
Lord Leconfield	Sussex, York (E.R.), Cumberland	54,615	51,940
Marquis of Ailesbury	Wilts, York (N. R.)	53,362	58,030
Earl Cawdor	Carmarthen, Pembroke	51,517	34,987
Sir Lawrence Palk, Bart.	Devon	10,109	109,275
Sir J.W. Ramsden, Bart	York (W.R)	8,589	167,601

In some cases the estimated rental exceeds the income derived from the property. Together with the returns of land-owners in England, there were issued similar ones for Scotland and Ireland. It is not a little interesting to compare the relative facts given in these various returns, which illustrate to a striking degree the diversity of the ownership of the soil and division of the land in the three portions of the United Kingdom. While in England the proportion of land-owners below an acre is 73.3, it is 85.5 per cent in Scotland, and 52.6 in Ireland. Again, of land-owners possessing more than one acre, the proportion who have less than 500 acres is 96.1 per cent in England, 86.5 per cent in Scotland, and 80.1 per cent in Ireland. With regard to England, the twelve largest owners hold in the aggregate 1,058,883 acres, while the twelve largest owners in Scotland possess 4 339.722 acres, and the twelve largest owners in Ireland 1,297,888 acres. Thus the ownership of the twelve principal land-owners of England is not one fourth that of the twelve chief land-owners of Scotland. The total number of land-owners in each of the divisions of the United Kingdom was given as follows in the official returns: —

Divisions.	Number of Owners of less than one acre.	Number of Owners of one acre and upwards.	Total Number of Owners.
England	703.289	269.547	972,836
Scotland	113,005	19,126	132,131
Ireland	36,144	32,572	68,716
United Kingdom	852,438	321,245	1.173,683

The gross estimated rental value of the landed property enumerated in the returns was stated as follows: —

Estimated Rental Value of Land.

England	£99,352,301
Scotland	18,698,774
Ireland	13,417,758
United Kingdom	£131,468,833

In England, one person in 20 of the population is an owner of land, against one in 25 in Scotland, and one in 79 in Ireland. The proportion of owners of land to inhabited houses is 1 to 4 in England, 1 to 3 in Scotland, and 1 to 14 in Ireland. In England, the average extent of land held by each owner is 33 acres, 3 roods, 30 perches, while it is 143 acres, 1 rood, 6 perches in Scotland, and 293 acres, 1 rood, 32 perches in Ireland. The average estimated rental of each owner of land in England is £102 3*s*. ($510.75), against £141 8*s*. ($707) in Scotland, and £195 3*s*. ($975.75) in Ireland. The average estimated rental value of the whole of the land in England and Wales is given at £3 0*s*. 2*d*. ($15.04) per acre, which is thrice that of Scotland, where the average is 19*s*. 9*d*. ($4.95) per acre, and four and a half times as much as in Ireland, where it is 13*s*. 4*d*. ($3 33) per acre.

The following table furnishes a concise account of the acreage under crops and otherwise, together with the number of live-stock in the two divisions of grazing and corn-growing counties of England, according to the agricultural returns for the year 1877: —

	Grazing Counties.		Corn Counties.	
	Acreage.	Percentage of Total.	Acreage.	Percentage of Total.
Total acreage returned	12,908,018	53 1	11,404,015	....
Wheat	1,047,077	35.1	1,940,052	64.9
Barley	724.679	36.2	1,275.852	63.8
Oats	777,215	52.2	712,784	47 8
Rye	15,800	32.5	32,804	67.5
Beans	126,851	27.0	343,302	73.0
Pease	69,820	22.8	236.536	77.2
Total corn crops	2,761,442	37.8	4,541,330	62.2
Potatoes	179,013	58.9	124,951	41 1
Turnips and swedes	679,234	45.4	816.651	54.6
Mangold	101 529	29.2	246,760	70.8
Carrots	3,054	21.1	11,391	78 9
Cabbage, rape, etc.	69,120	29.2	107,098	60.8
Vetches, lucerne, etc.	125,367	29.8	295,006	70.2
Grass under rotation.. for hay	810,654	50.4	798,703	49.6
Grass under rotation.. not for hay	673,958	59.7	454,072	40.3
Total green crops and grass	2,641.929	48.1	2,854,632	51.9
Bare fallow	251,459	43.6	324,776	56.4
Permanent pasture.. for hay	2,033,187	62.8	1,206,178	37.2
Permanent pasture.. not for hay	5,208,654	68 4	2,409,997	31.6
Flax	2 845	39.5	4.365	60.5
Hops	8.502	11.9	62.737	88.1
Orchards, etc.	122,499	77.0	36 596	23.0
Woods, etc.	676,139	51.0	649,626	49.0
Live-Stock.				
Horses, for agriculture	365,664	48.0	395,421	52.0
" unbroken and for breeding	171,075	55.3	138,044	44.7
Cattle	2,621,282	65.9	1.358,368	34.1
Sheep	9,697.359	52 9	8,633,018	47 1
Pigs	1,028,734	48.6	1,086,017	51.4

It appears from the last Agricultural Returns that the extent of arable land in England and Wales is on the decrease, as is also the produce of live-stock, while, on the other hand, the area of pasture-land is on the increase. The land under wheat fell from 3.336,888 acres in 1872 to 2.987,129 in 1877, in England; and from 126.367 acres in 1872 to 100,226 in 1877, in Wales. During the same period the acreage under potatoes fell in England from 339,056 to 303,964, and in Wales from 48,417 to 42,942; and that under clover in England from 2,822,392 to 2,737,387, and in Wales from 370,850 to 351,797. In the acreage under barley and oats there was a slight increase in England, but a decrease in Wales; while in the acreage under turnips and swedes there was a trifling increase in England and a decrease in Wales during the period. Taken altogether, the extent of arable land in England fell from 13,839,000 acres in 1872 to 13,454,000 acres in 1877, being a decrease of 385.000 acres. In Wales, the extent of arable land sank from 1,104,000 acres to 999.000 acres in the same period, the decrease amounting to 105,000 acres. The decrease of arable land during the five years was very steady, and so likewise was the increase in the acreage of pasture-land. There were in England under pasture — exclusive of heath and mountain land — 9,991.000 acres in 1872, and 10,858.000 acres in 1877, the increase in the five years amounting to 867,000 acres, being more than double the extent of decrease of arable land. In Wales there were under pasture 1,532,000 acres in 1872, and 1,732,000 acres in 1877, making the increase amount to 200,000 acres, this also being not far from double that of the decrease in arable land. The decrease in the extent of arable land, and simultaneous increase of pastures, is more or less satisfactorily explained by the fact of England being supplied with corn from the U. States and other foreign countries, where it can be grown cheaper than at home; while the produce of pasture-lands cannot be brought in the same way into the country. But if the decrease of arable land and increase of pastures can be thus explained, it is not so easy to account for the decline of live-stock which also took place during the same period, more especially from 1874. It might have been expected that the widening of the pastural area would have led to an increase of live-stock, but the contrary was the case, more especially as regards horned cattle and sheep. In England there were 4,305,440 head of cattle in June, 1874. and 3.979.650 head in June, 1877, so that there was a decrease of 325,790 head in three years. During the same period the number of cattle in Wales fell from 665,105 to 616.209, being a decline of 48,896. The decrease in numbers was even greater in sheep. There were 19,859,758 sheep in England in June, 1874, and 18,330.377 in June, 1877, being a decrease of 1,529,381. In Wales, during the same period, the number of sheep fell from 3,064,696 to 2,862,013, being a decrease of 202.683. Thus the total decline in the number of sheep in England and Wales was no less than 1,732,064 in the short space of three years. The great diminution of live-stock during the triennial period from 1874 to 1877 was not confined to England and Wales, but occurred simultaneously in Scotland, as well as in Ireland, being greatest in the latter country, where the decline in sheep alone amounted to 10¼ per

cent. We see, besides, that in the census returns of 1871 the number of persons entered as "agriculturists" in England and Wales was 1,447,481, comprising 1,264,031 men, and 183,450 women. At the preceding census (1861) the number of "agriculturists" was given at 1,833,652, showing a diminution of 386,171 within the decennial period. We think that the high rental of the land, combined with the limited ownership of the soil, two thirds being in the hands of little over ten thousand persons and the rest divided among nearly a million, have much to do with the rapid decline of agriculture in England.

II. Scotland.

Scotland, the northern portion of Great Britain, extends in its main land from lat. 54° 38′ to 58° 41′ N., and lon. 1° 45′ to 6° 14′ W., and including the islands to lat. 60° 50′ N. and lon. 8° 35′ W. It is separated from England by a waving line of the Cheviot Hills in the centre; by the Tweed, which enters the sea of Berwick, on the E.; and by the Solway Frith on the W. Its E. shores are washed by the North Sea, and its W. by the Atlantic. It is of an oblong, irregular form, extending longitudinally due N. and S. 280 m., and varying in breadth from 175 to 100, 50, and 30 m. Area 30,685 sq. m., including its islands, 186 in number. Few countries of equivalent magnitude display so great an extent of seacoast as Scotland, its aggregate length being about 2,506 m. It is extremely irregular in its surface and outline, and, compared with England, may be said to be sterile, rugged, and mountainous. With the exception of a few rich alluvial tracts, there are no extensive vales in *S.*; its surface, even when least mountainous, being generally varied with hill and dale. It has been separated into the two great divisions of the *Highlands* and the *Lowlands*, and also into the Northern, the Middle, and the Southern. The first, or Northern, division is cut off from the Middle by the chain of lakes which stretch from the Moray Frith to Loch Linnhe. The second, or Middle, division is separated from the Southern by the friths of Forth and Clyde, and the Great Canal. The Northern division consists generally of an assemblage of vast mountains, here and there intersected by fertile valleys, chiefly towards the S. and E. coasts. A portion of them are clothed with green herbage, more especially where sheep-farming prevails; but, in general, they are covered with heath growing upon peat, rock, or gravel; and they frequently terminate in mountain-caps of solid rock, or in vast heaps or cairns of bare and weather-beaten stones. The Middle division is also mountainous, the Grampian range intersecting this district, and extending from the eastern to the western sea, and occupying a breadth of from 40 to 60 miles. The western parts of Argyllshire, which are also included in this district, are rugged, mountainous, and deeply indented by inlets of the ocean. In these two divisions, which comprehend more than two thirds of Scotland, the arable ground consists of but a small proportion to the mountainous regions. On the eastern coasts, however, the proportion of the cultivated to the uncultivated land is much greater. In the Southern division every variety of aspect is found; verdant plains, watered by copious streams, and covered with innumerable cattle; gently rising hills and bending vales, fertile in corn, waving with wood, and interspersed with meadows; lofty mountains, craggy rocks, deep narrow dells, and tumbling torrents; nor are there wanting as a contrast, barren moors and wild uncultivated heaths. In this district are the different ranges of the Cheviot Hills; the Sidlaw Hills, terminating at Perth; the Ochil Hills, forming the middle division; and the hills of Kilsyth and Campsie. Between the Sidlaw ridge and the Grampian Mountains lies the extensive and fruitful valley of *Strathmore* stretching from Stirling to Stonehaven. Another strath or valley, called *Glenmore*, runs across the country from Loch Eil to the Murray Frith. This strath, in different parts, has particular names. — *Rivers.* In the Northern division, the principal are the Beauly, Naver, Thurso, etc.; in the Middle division, the Spey, the Dee, the Don, and the North and South Esk; about 30 m. farther S is the Tay, one of the largest rivers in Britain. In the Southern district are the Forth, the Clyde, and the Tweed, and the numerous rivers which empty themselves into the Irish Sea and the Solway Frith; the Ayr, the Girvan, the Southern Dee, the Nith, the Annan, and the Liddel. — *Lakes, or Lochs*, are numerous and extensive. The principal are Lochs Lomond, Awe, Ness, Shin, Maree, Tay, Erich, Shiel, Lochy, and Katrine. — *Islands.* The principal groups are the Orkneys, the Shetlands, and the Hebrides, besides Arran and Bute — The *climate* is extremely variable. From its insular situation, however, the cold in winter is not so intense, nor the heat in summer so great, as in similar latitudes on the Continent; and although the range of the thermometer is considerable, it seldom maintains an extreme for any length of time. The annual average temperature may be estimated at from 45° to 47°. The mildness of the winter is well illustrated by the fact that Mr. McNab, of the Royal Botanical Gardens at Edinburgh, reported 138 species of flowers in bloom on New Year's Day, 1874, of which 35 were winter or spring flowers, and 103 summer or autumn flowers. — *Minerals.* Iron-stone, iron-ore, lead, and septaria iron-stone are abundant. Copper has been discovered in many places. The other metallic substances are cobalt, bismuth, manganese, wolfram, plumbago, and mercury; the latter in very small quantities. Coal is abundant in the Southern and Middle districts. Limestone, freestone, or sandstone, and slate, are found in every district. Marbles are also found. Most of the gems and precious stones have been found among the mountains of Scotland, the diamond excepted. Jasper is found in great variety, and rock-crystal, commonly denominated *cairngorm*, from the mountain of that name in Banffshire. Chalcedony is also found. Scotland is divided into 33 civil counties, grouped under 8 geographical divisions, as follows: —

Divisions and Civil Counties.	Inhabited Houses.	Population.		
		Males.	Females	Total.
1. Northern: —				
Shetland	5,740	13,080	18,525	31,605
Orkney	6,391	14 346	16,926	31,272
Caithness	7,476	18,939	21 050	39,989
Sutherland	4,798	11,127	12,559	23,686
2. Northwestern: —				
Ross and Cromarty.	15,932	38,029	42,880	80,909
Inverness	16,659	40,798	46,682	87,480
3. Northeastern: —				
Nairn	2,046	4,771	5,442	10 213
Elgin	8,564	20,278	23,320	43.598
Banff	11,663	29,345	32,665	62,010
Aberdeen	34,691	115,891	128.716	214.607
Kincardine	6,681	16,790	17,861	34,651
4. East-Midland: —				
Forfar	25,859	106,223	131,305	237.528
Perth	22,387	60,592	67.149	127,741
Fife	27,340	74.700	85,610	160,310
Kinross	1,669	3.387	3,821	7,208
Clackmannan	3,447	11,543	12,199	23,742
5. West-Midland: —				
Stirling	14,315	48,160	50,019	98,179
Dumbarton	8,043	28,817	30,022	58,839
Argyll	14 387	36,898	38,737	75,635
Bute	2,434	7,624	9,353	16,977
6. Southwestern: —				
Renfrew	13,606	103 612	113.307	216.919
Ayr	27.132	98.110	102.635	200.745
Lanark	49,080	377,739	387,540	765,279
7. Southeastern: —				
Linlithgow	6,507	21,074	20.117	41.191
Edinburgh	28,437	153.821	174,514	328,335
Haddington	7,322	18.060	19.710	37,770
Berwick	6,534	17.406	19,068	36.474
Peebles	2,246	5.946	6,368	12,314
Selkirk	1,752	6,730	7,271	14,001
8. Southern: —				
Roxburgh	7 869	25,703	28,262	53,965
Dumfries	13.833	34,782	40.012	74.791
Kirkcudbright	7,705	19,479	22.373	41,852
Wigtown	6,930	17,833	20 962	38,795
Total population ...	412,185	1,603,143	1,756,875	3,360 018
Population to the square mile	....	....	....	109

The following table exhibits the number of the population of Scotland at the dates of the several enumerations, together with the increase between each census, and the percentage of increase: —

Dates of Enumeration.	Population.	Increase	Percentage of decennial Increase.
March 10, 1801	1,608,420	......	....
May 17, 1811	1,805,864	197 657	12 27
May 28, 1821	2,091,521	285,657	15.82
May 29, 1831	2,364.386	272.865	13.04
June 7, 1841	2,620,184	255.798	10.82
March 31, 1851	2.888,742	268,558	10.25
April 8, 1861	3,062,294	173,552	6 00
April 3, 1871	3,360,018	297,724	9 80
Increase in 70 years		1,751,598	100 12

Edinburgh, the ancient capital of Scotland, is situated in the county of Mid-Lothian or Edinburgh, to the S. of the Firth of Forth. The Royal Observatory, which is built on the summit of the Calton Hill, in the N. E. quarter of the city, is in lat. 55° 57′ 23″ N., lon. 12 m. 43.06 s. of time W. of the meridian of Greenwich. Edinburgh stands on high, uneven ground, being built on three ridges running E. and W. The central ridge on which the city was originally built, terminates abruptly, on the W., in a precipitous rock nearly 400 feet above the level of the sea, on which is the castle, while to the E. it inclines to a plain or valley. From an early date down to this century the special associations with the national literature have been identified with the ancient capital, and have won for it the name of Modern Athens. To this the actual correspondence of its site to that of Athens no doubt also contributed. Literary taste and culture still characterize Edinburgh society; but, apart from the exceptional influences of pre-eminent genius, the causes which largely contributed to give it so special a character no longer exist. In Scott's early days a journey to London was beset with difficulties, and even dangers; whereas railroads have now brought it within a few hours' distance, and Scottish artists and literary men are tempted to forsake Edinburgh for the great centre of all national activities. Nevertheless, the influence of the past survives in many ways. Edinburgh is not a manufacturing city, but retains even now something of the character of the Scottish capital, as the resort of those whose means enable them to enjoy in ease and comfort its social amenities without indulging in the costly gayeties which a London season involves. The progress of Edinburgh during the present century has been remarkable. In 1801 the population, including the Canongate and other inter-mural suburbs was 66.544; in 1877 it had risen to 218,729. The Registrar-General of Scotland reported the following as the estimated pop. of the 6 other principal towns in 1877: Glasgow, 555,933; Dundee, 142,951; Aberdeen, 98,181; Greenock, 70,192; Leith, 54,257; and Paisley, 48,679.

In 1877 the number of registered paupers and their dependants, exclusive of casual poor, who were in receipt of relief in parishes of Scotland, was 96,404, against 128,976 in 1868. The number of criminal offenders committed for trial was: men, 2,172; women, 505; total 2677, of which 2,010 were convicted. The following table gives the number of births, deaths, and marriages in each of the ten years 1868 to 1877: —

Years.	Population.	Births.	Deaths.	Marriages.
1868	3,188,125	115,673	69.386	21,853
1869	3,205,481	113,395	75,789	22,083
1870	3.222.837	115,423	74.067	23,788
1871	3,366.375	116.127	74,644	23.966
1872	3,399,226	118.873	75,741	25,580
1873	3,430,923	119,738	76,857	26,730
1874	3,462,916	123,795	80,676	26.247
1875	3.495.214	123.693	81.785	25.921
1876	3.527,811	126,749	74,122	26,563
1877	3,560,715	126,824	73,946	25,790

Agriculture. More than three fourths of the surface of the country is sterile, consisting of mountains, morasses, and other waste lands. Out of the total, computed at 19,496,132 acres, only 4,640,803 acres were cultivated in 1876. As in England, and partly owing to the same causes, the quantity of wheat and other cereals grown is gradually diminishing. The division of the soil is greater than in England and Wales, but less than in Ireland. In 1877 the number of land-owners possessing more than an acre was 19,225, and of those possessing less than an acre was 132,230. (See also agriculture above, on page 470.)

III. Ireland.

This celebrated island is situated between lat. 51° 26′ and 55° 21′ N., lon. 5° 20′ and 10° 26′ E. It is rhomboidal in shape, and placed at the E. extremity of the Atlantic Ocean, which washes its N. W. and S. shores, while its E. coast is separated from the adjacent island of Great Britain by the Northern Channel, which at one point is only 13½ m. wide, the Irish Sea, about 130 m. in width, and St. George's Channel, which is 69 m. wide between Dublin and Holyhead, and somewhat less at its S. extremity. The largest diagonal line that can be drawn within the island, viz., from Tor Head, in Antrim, to Mizen Head, in Cork, measures 302 m.; and the shorter, from Carnsore, in Wexford, to Erris Head, in Mayo, is 210 m. in length. The breadth of the country, from Dundalk to Ballyshannon, is 85 m.; from Dublin to the head of Galway Bay, 110 m.; and the indentations of the coast by harbors, arms of the sea, and mouths of rivers are so numerous, that scarcely an acre of land in the country is more than 50 m. from the sea or good navigation. Area 31.874 sq. m., or 20,322,641 acres. If the possession of numerous fine bays and harbors made a country great as a commercial and maritime power, Ireland would be second to none in Europe. Pre-eminent even in Ireland is the magnificent harbor of Cork, securely land-locked, protected by strong batteries, and used as the only naval station on the Irish coast. Baltimore Harbor, Skull, Cape Clear, Crookhaven, Dunmanus, and Bantry Bay are all of sufficient depth and capacity for large vessels. On the W. coast are Berehaven, Kenmare River, Valentia, Ventry, Smerwick, Brandon Bay, the estuary of the Shannon, Galway Bay, Roundstone Bay, Ardbear or Clifden, Ballynakill and Killery Harbors, Clew, Blackrod, and Killala Bays, with many others of less importance. On the N. coast are Milroy Harbor, and the fine gulfs of Lough Swilly and Lough Foyle. The E. coast has been less favored by nature, and furnishes only one bay, with sufficient depth of water for the largest vessels, that of Strangford. The Bay of Dublin, which is much exposed, contains the fine artificial harbor of Kingstown. Belfast, Newry, Drogheda, Wicklow, Arklow, and Wexford have all been converted into ports, but are naturally deficient in the requisites for good harbors. Between Wexford and Cork is the fine Estuary of Waterford, formed by the confluence of the Rivers Suir, Nore, and Barrow. Altogether, Ireland possesses 14 harbors for the largest ships, 17 for frigates, from 30 to 40 for merchant-vessels, with many good summer roadsteads, and an infinity of small harbors for fishing-boats. The islands off the coast of Ireland are numerous, but generally of small size; the largest are Rathlin and Tory in the N.; Achill, Clare, the South Arran Islands, and Valentia, in the W.; and Whiddy and Cape Clear in the S. — *Surface*. As contrasted with Scotland, or even the greater part of England, Ireland may be said to be a flat country. Still, the surface is in parts much diversified; and even when it is quite flat, the

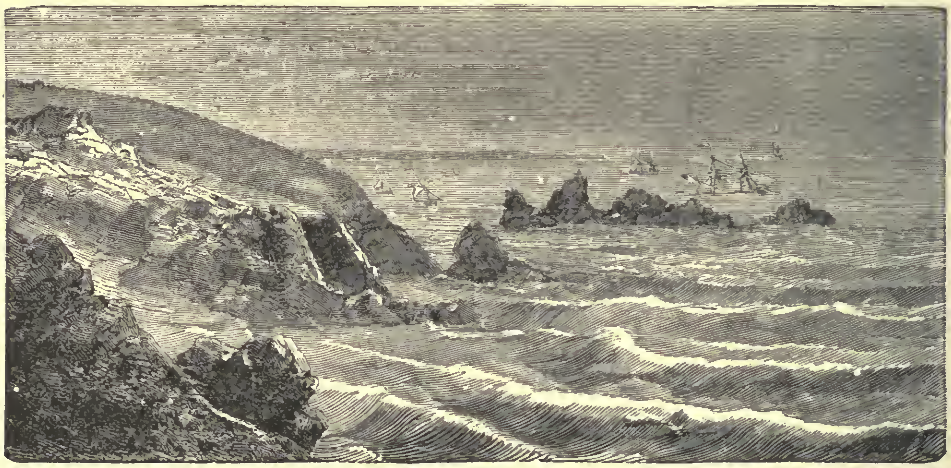


Fig. 245. — Land's End.

prospect is generally bounded by hills or mountains in the distance. The elevation of the surface of Ireland is stated in the following table from the Land Tenure Commissioners' map: —

	Square miles.
Between sea-level and 250 feet in height	13,242¾
" 250 and 500 feet	11,797⅛
" 500 " 1000 "	5,797⅞
" 1000 " 2000 "	1,589¾
Above 2000 feet in height	82¼
Total	32,509⅜

The highest peaks in the chief mountain groups are: —

	Feet.
Carntual, M'Gillicuddy's Reeks, Co. Kerry	3,414
Lugnaquilla, Wicklow	3,039
Slieve Donard, Mourne Mountains, Co. Down	2,796
Mulrea, Co. Mayo	2,688
Comeragh, Co. Waterford	2,597
Errigal, Co. Donegal	2,462
Trostan, Co. Antrim	1,810

Ireland was once so thickly covered with timber as to receive the name of the Island of the Woods. During the early periods of its connection with England its extensive and impenetrable forests formed a main obstacle to the progress of the English troops. Westminster Hall is said to be roofed with oak cut in the woods of Shillelagh. Numerous trunks of large trees are constantly found in the bogs. Even in mountain tracts, devoted for a long succession of years to the pasturage of sheep, timber-trees shoot up spontaneously wherever the land is secured from the intrusions of cattle. Many places, where the vestige of a plantation is not to be seen, retain names of which the word "wood" forms a component part; and in localities where the most attentive culture will not suffice to keep any tree or shrub alive on account of the western blasts, large trees are found embedded in the bogs. The different kinds of timber found in the bogs of Ireland are confined to oak, fir, yew, holly, sallow, and birch. Two centuries ago, when Ireland was covered with forests, there were numerous small iron-works, in which wood charcoal was employed, and vast quantities of wood used, until the country was gradually stripped of its supply, and the working of iron was consequently abandoned. The extension of agricultural improvement, and more especially the timber act, which gives the tenant, at the expiration of his lease, a pecuniary interest in the trees he has planted, are gradually removing this defect, the consequence of ages of disturbance and desolation; but trees in large quantities are generally found in Ireland only in the vicinity of the residences of the gentry, except in some favored spots, which are well wooded.— *Rivers and Lakes.* Ireland is plentifully watered, having to boast of an unusual number of rivers and inland areas of water. At the head of the former is the Shannon, which, as a channel of internal communication, is inferior to no river in the United Kingdom, being navigable for 214 m., or throughout the greater part of its entire course; the rivers next in magnitude and importance are the Barrow, Suir, Nore, Lee, Blackwater, Foyle, Slaney, Boyne, Baun, Kenmare, Moy, etc. Ireland is more remarkable for the number and extent of its lakes, or *loughs*, than either Scotland or England. Lough Neagh, in Ulster, extends over about 100,000 acres. Lough Erne, in county Fermanagh, consists of two considerable lakes connected by a winding strait, on an island of which the town of Enniskillen is built. Loughs Corril, Mask, and the exquisitely beautiful lakes of Killarney are the other principal sheets of water. The total superficies of the Irish lake-system is estimated at 455,399 acres, of which 32,474 acres are included in the province of Leinster, 44,652 in Munster, 183,796 in Ulster, and 194,477 in Connaught.

Minerals. Iron is found in many parts of the country; copper, lead, and sulphur mines occur in parts of Leinster and Munster: and gold and silver have been found in Wicklow. Copper, however, is the only metal which at present appears to be remuneratively raised; the ore is mostly sent to Wales for smelting. Antimony, manganese, serpentine of good quality, fuller's-earth, slate, gypsum, etc., with beryls and garnets, are the other chief mineral products. Several coal-fields exist, resting on a limestone basis. In Ulster, the district of Coal Island, in the country of Tyrone, produces coal of good quality, extensively used in the neighborhood; the small coal-field at Ballycastle, in Antrim, is of no economical importance. The prov. of Connaught affords beds of coal in Leitrim, Roscommon, and Sligo, but rarely exceeding three or four inches in thickness. The Munster coal-fields are in the counties of Cork, Kerry, and Limerick. The chief coal-district, however, is that of Leinster, in Carlow, Kilkenny, and the Queen's County. This coal, as well as that of the Munster district, is anthracitous; that of Connaught is bituminous. The native coal is only used in the districts where it is raised, and neither the quantity nor the quality has been found such as to interfere with the importation of coal from Great Britain, which probably exceeds 1,000,000 of tons annually. The deficiency of good coal is generally less felt as regards domestic than manufacturing purposes, about 2,800,000 acres, or nearly ¼ part of the entire surface of the island, consisting of bog-land, which is capable of furnishing an almost inexhaustible supply of peat at very little more expense than that of the labor required in digging it. In not a few localities they have been wholly cut out, and when this is the case, and other bogs are not easily accessible, the inhabitants have suffered great privation from the want of fuel. — *Climate.* The climate of Ireland much resembles that of England, but rain is more frequent, and, even in the absence of rain, the atmosphere is largely impregnated with moisture. This circumstance, the result of the insular position of the country, and of the prevalence of the W. winds for three fourths of the year, accounts for the greater verdure of the island, and for the trees continuing much longer in leaf than in England. In the driest seasons Ireland rarely suffers from droughts, but the crops are often injured by too much wet. Hence, it is naturally much better adapted for a grazing than for an agricultural territory, and its superiority as a pastoral country was well known to the ancients.

The numbers of the population of the counties, cities, and towns of the 4 provinces of Ireland were found to be as follows at the census of 1871: —

Provinces, Counties, Cities, and Towns.	Population.		
	Males.	Females.	Total.
Province of Leinster.			
Carlow county	25,356	26,116	51.472
Drogheda town	6.661	7.728	14.389
Dublin city, municipal	115.363	130,359	245,722
" suburban townships	21.573	28,546	50,119
" county	51,256	58,528	109.784
Kildare "	45,646	38,552	84 198
Kilkenny city	6.007	6,657	12,664
" county	46.892	49,746	96.638
King's "	38,192	37,589	75,781
Longford "	32,418	31,990	64,408
Louth "	34.423	35,386	69 809
Meath "	47.934	46,546	94 480
Queen's "	38.518	38,553	77 071
Westmeath "	39,768	38,648	78,416
Wexford "	64 125	68,381	132.506
Wicklow "	39,376	39.133	78,509
Total of Leinster	653.508	682,458	1,335,966
Province of Munster.			
Cashel city	1,832	2,144	3.976
Clare county	73.470	74,524	147.994
Cork city	36,713	41.669	78.382
" county, E. R	130.895	130.489	261.384
" " W. R.	87,887	88,393	176 280
Kerry "	97,560	98,454	196.014
Limerick city	18,257	21.571	39.828
" county	74.344	77,141	151.485
Tipperary " N. R.	45.976	46,910	92,886
" " S. R.	58.333	61.015	119,348
Waterford city	10.946	12,391	23,337
" county	47.815	51,673	99,488
Total of Munster	684,028	706,374	1,390,402
Province of Ulster.			
Antrim county	112.466	123.470	235 936
Armagh city	3.651	4.215	7,866
" county	82.345	89,010	171.355
Belfast town	79.754	94,640	174.394
Carrickfergus county	4.296	5.156	9 452
Cavan county	70.331	70.224	140 555
Donegal "	105.903	112,089	277.775
Down "	130.683	147,092	217 992
Fermanagh county	45.365	47,323	92 688
Londonderry city	11.711	13,531	25,242
" county	71.526	77,164	148,690
Monaghan "	54.940	57,845	112.785
Tyrone "	105,072	110,596	215 668
Total of Ulster	878,043	952.355	1,830.398
Province of Connaught.			
Galway county	116.187	118,886	235 073
" town	6,110	7.074	13 184
Leitrim county	47.579	47.745	95.324
Mayo "	120.729	125.126	245 855
Roscommon county	71.093	70.153	141 246
Sligo "	56,846	58.465	115.311
Total of Connaught	418.541	427,449	845.993
Total population	2,639,826	2,771,590	5,411.416
Population to the sq. m.	....	....	169

Few countries in the world have increased in population so rapidly as Ireland during the first 40 years of the present, and the conclusion of the last century. Arthur Young, in his *Tour through Ireland*, in 1766, observed that it everywhere evinces the marks of a rapid increase of population. It is generally supposed that the number of the people increases in the ratio of food and comforts, and that an increase of population is a convincing proof of the advancing prosperity of a nation. The effect of the failure of the potato crop in depopulating the country would show that the population had outstripped the progress of wealth and the increase of industry, and had reduced their wants to the lowest point without procuring an addition to the comforts of life corresponding to the increase of the population. From 850,000 in 1652, the population rose to 2,317,384 in 1760; to 4,088,226 in 1792; to 5,937,856 in 1811: to 6,801,827 in 1821; to 7,767,401 in 1831; and to 8,175,124 in 1841. At the following census the population was found to have sunk to 6,552,386 in 1851; to 5,798,564 in 1861; and to 5,411,416 in 1871. From 1851 to 1875 the total emigration from Ireland was over 2½ millions; and from 1820 to 1878 the emigration of Ireland to the U. States only was 3,031,451 (see EMIGRATION). The subjoined table gives the number of births, deaths, and marriages in each of the 8 years from 1870 to 1877: —

Years.	Population.	Births.	Deaths.	Marriages.
1870	5,412,660	150,151	90,695	28,835
1871	5,386,708	151,665	88,720	28,960
1872	5,366,696	149,292	97,577	27,114
1873	5,337,261	144,377	97,537	26,270
1874	5,314,844	141,288	91,961	24,481
1875	5,309,494	138,320	98,114	24,037
1876	5,321,618	140,438	92,324	26,388
1877	5,338,906	139,498	93,509	25,078

In 1878 the number of paupers in receipt of relief in unions was 85,530, against 74,743 in 1869. During the same year the number of criminal offenders committed was: men, 3,113; women, 758; total, 3,871; of which 2,303 were convicted.

Agriculture. The diversity of soils is not so great as in England. There are no stiff, clayey, or chalky deposits. Sandy soils are also rare. Loam, resting on a substratum of limestone, predominates; and though often very shallow, it is almost everywhere very prolific. In short, deducting the bogs and mountains, it is certain that this island is about the richest country, in respect of soil, in Europe. As a grazing country, it is probably superior to any in the Old World. The Agricultural Statistics of Ireland, issued from the General Register Office in 1878, show the number of acres under various crops as follows, in 1877 and 1878: —

Crops.	Acres in 1877.	Acres in 1878.
Wheat	129,297	154,011
Oats	1,476,172	1,412,637
Barley	226 216	243 929
Rye	11,124	11,439
Beans and pease	9,786	9,405
Potatoes	873,291	846,985
Turnips	334,379	329,942
Mangel and beet roots	48,948	45,187
Cabbage	39,307	39,463
Carrots and other crops	34,750	35,161
Vetches and rape	34,334	21,022
Flax	123,380	111,808
Meadow and clover	1,924,917	1,942,716

The bulk of the population of Ireland depend for employment and subsistence on the soil. The competition for small patches of land is consequently very keen, and the rents greater than the occupiers can afford; though not greater than might be paid for them, were they consolidated into proper sized farms, and cultivated on an improved system. In *I.*, in fact, the possession of a piece of ground has long been a condition all but indispensable to existence; and we need not, therefore, wonder that the occupiers should cling with desperate tenacity to their small patches. This has led in most parts to a sort of tacit but well-understood agreement among the *cottiers* or small farmers, to support each other against interlopers; and, in the greater part of the country, it is as necessary to the quiet possession of the land to secure what is called *tenant-right*, or the good-will of the occupier, as it is to make a bargain with the landlord. Any tenant who should neglect this indispensable precaution would run a great risk of being disturbed in, or forcibly ousted from, his holding. Indeed, most of the agrarian outrages which have for so long agitated the country have been directly or indirectly connected with land-occupancy. It is not necessary to enter into any lengthened disquisitions as to the various circumstances which have led to that minute parcelling of the land which is the *bane* of *I.* The greatest influence is, doubtless, to be ascribed to the custom of providing for the sons, and sometimes, also, the daughters of the occupiers of land, by giving them shares of their father's holdings. A good deal of what is peculiar in the mode of occupying land in this island has grown out of the conditions under which it was originally acquired by the ancestors of its present owners About $\frac{7}{10}$ of the soil was forfeited under Cromwell and William III.; and this amount of real estate was, for the most part, either gratuitously granted to, or was acquired at a nominal rate of purchase by noblemen and gentlemen of fortune and influence in England. Such persons could not be expected to leave their country to reside permanently in *I.*; and, in point of fact, they but rarely visited their Irish estates, but satisfied themselves with the acquisition of what rents they could get for them. No sympathy existed between them and their tenants; the religious and political principles of the one party were diametrically in antagonism to those of the other. The landlords looked upon their tenants as a sort of unwilling bondsmen, who, if any favorable opportunity should present itself, would immediately shake off their dependence on them; and, on the other hand, the tenants regarded the landlords as usurpers of an alien race unjustly intruded on the properties of others, and as enemies to the religion and rights of the Irish people Very few had any confidence in the stability of such a state of things; and it could not be expected that landlords should care much about the permanent interests of their estates, or that they should lay out any considerable sum on their improvement. To build a farm-house or out-offices was an outlay which, for a lengthened period, no Irish landlord ever incurred; and even to this day the old habit maintains an ascendency, and the great majority of land owners lay out little or nothing on buildings. Generally speaking, what are called farm-houses and out-buildings in England do not exist in Ireland; and the aspect of the *cabins*, or cottages, which, in the vast majority of instances, are of the most ramshackle description; the smallness of the fields, which, instead of hedges and ditches, or stone fences, are usually divided by turf dykes; and the poverty of the house furniture, and of the agricultural implements, — all impress one with most unfavorable convictions. But, how mortifying soever the contrast between the fertility of the soil and the condition of its occupiers, it is some satisfaction to remark that it is less striking now than formerly. In many districts a considerable change has been made towards a better state of things; but the evil is still far from being at its end, as exemplified by the violent agrarian agitation which took place in 1879, caused by the tenacity of landlords in exacting rents that the poor Irish tenants could not possibly pay, the failure of the crops in that year having led the agricultural population almost to starvation.

IV. MINES AND MANUFACTURES.

Next to agriculture, the material resources of *G. B.*, and more especially of England, lie in its minerals. In the "Mineral Statistics of the United Kingdom," published in 1877, by the keeper of mining records, the mineral produce of *G. B.* is summarized as follows: —

Minerals.	Quantities. Tons.	Cwts.	Value. £
Coal	133,344,766	0	46,670,668
Iron ore	16,841,583	14	6,825,705
Copper ore	79,252	0	317,186
Tin ore	13,688	9	600,923
Lead ore	79,096	6	1,218,078
Zinc ore	23,613	8	90,142
Iron pyrites	48,809	14	43,870
Arsenic	4,228	1	28,092
Manganese	2,796	17	9,783
Ochre and umber	3,805	4	4,478
Wolfram	23	10	172
Fluor spar	337	10	230
Clays	3 971,123	0	744,224
Oil shales	610,785	0	319,853
Salt	2,273,256	0	1,135,628
Barytes	23,561	18	24,479
Coprolites	258,150	0	625,000
Gypsum	61,741	0	13,571
Sundry minerals, including China stone	....		13,750
Total value of minerals produced in 1876....			58,691,832 $293,459,160

Under another calculation, the keeper of mining records gives the following summary of the total value of minerals, together with metals, obtained from the mines of the United Kingdom in 1876: —

Coal	£46,670,668
Metals, obtained from ores	18,668,818
Earthy and other minerals	2,887,367
Total value	£68,226,853

The metals obtained from ores are classified as follows, according to quantities and value, in 1876: —

Metals.	Quantities.	Value.
	Tons.	£
Pig-iron	6,555,997	16,062,192
Lead	58,667	1,270,415
Tin	8,500	675,750
Copper	4,694	392,300
Zinc	6,641	158,011
	Ounces.	
Silver	483,422	106,262
Gold	293	1,138
Other metals	......	2,750
Total value	......	18,668,818

It will be seen by a glance at the preceding tables, that the mineral wealth of *G. B.* lies, in substance, in two articles, namely, coal and iron ore. From these springs, as immediate produce, a third, namely, pig-iron. Coal and iron ore together form, as regards value, over $\frac{9}{10}$ of the mineral produce; while pig-iron by itself holds nearly the same position in value among the metals produced in *G. B.*— *Coal.* In the production of the by far most important article of *G. B.'s* mineral wealth, to which all others are but appendages, England and Wales stand foremost to such an extent as to throw the other two divisions of the United Kingdom into comparative insignificance. To the total coal produce of *G. B.*, in the year 1876, England and Wales contributed 114,554,278 tons, being $\frac{6}{8}$ of the whole. The remainder, 18,790,488 tons, was produced almost entirely in Scotland, — the mines of East Scotland furnishing 11,667,648 tons, and those of West Scotland 6,997,904 tons. The production of coal in Ireland in 1876 was not more than 124,936 tons. The gradual rise in production and value of coal is indicated in the subjoined table: —

Years.	Quantities.	Value.
	Tons.	£
1855	61,453,079	16,113,267
1858	65,008,649	16,252,162
1861	83,635,214	20,908,803
1864	92,787,873	23,197,968
1867	104,500,480	26,125,145
1870	110,431,192	27,607,798
1873	127,016,747	47,631,280
1876	133,344,766	46,670,668

The production of coal in *G. B.* was more than doubled in the period from 1855 to 1876, but the exports to foreign countries during the same time increased nearly eight-fold. From 4,976,902 tons in 1855 the exports rose to 9,170,477 tons in 1865, and to 11,702,649 tons in 1870. They further rose to 13,198,494 tons in 1872, to 13,927,205 tons in 1874, to 14,544,916 tons in 1875, and to 16,299,077 tons in 1876. Of the total exports of the year 1876 France took 3,160,555 tons, Germany 2,243,722 tons, and Italy, Russia, and Sweden and Norway, each a little over a million tons, the remainder being distributed over thirty other foreign countries and British colonies. Vast as has been the amount of the coal exports in recent years, they still represent less than $\frac{1}{8}$ of the coal produce of the country. It is an admitted fact that the price of coal, which in recent years has been gradually rising in England, must continue to rise, both on account of its increased consumption, and of the constantly growing expenses of raising it. Although the total area of the coal-fields of *G. B.* extends, according to the most authentic estimates, over 5,400 sq. m., comparatively few new pits have been opened in recent years; and the ever-increasing demand has been supplied by the deepening as well as widening of the best collieries. This could only be achieved at an increased outlay, inasmuch as the cost of raising coal to the surface, and the attendant expenses of administration and supervision, are far greater than the cost of the actual displacement of the material from its beds. (See also COAL, page 176.)

Iron Ore and Pig-Iron. Though vastly inferior, as a source of national wealth, to coal, and deriving nearly all its value from it, still the second most important produce of English mines, the iron ore, has the greatest effect upon the industrial character of the country. England and Wales alone produce iron ore, the amount raised in Scotland and Ireland being quite insignificant. It amounted in Scotland to 5,226 tons, valued at £3,432 ($17,160), and in Ireland to 116,066 tons, valued at £60,748 ($303,740) in 1876. The whole of the rest of the produce of *G. B.*, 16,720,291 tons, valued at £6,761,525 ($33,807,625), was raised in England and Wales. The pig-iron produced in *G. B.* in the year 1876 came from 17,813,818 tons of iron, of which amount 16,841,583 tons were raised at home, and the remainder, 972,235 tons, imported from foreign countries, principally from Italy, Spain, and Portugal. The following table exhibits the quantities and value of pig-iron produced in *G. B.* in every third year from 1855 to 1876: —

Years.	Quantities.	Value.
	Tons.	£
1855	3,218,154	8,045,385
1858	3,456,064	8,640,160
1861	3,712,390	9,280,975
1864	4,767,951	11,919,877
1867	4,761,023	11,902,557
1870	5,963,515	14,908,787
1873	6,566,451	18,057,739
1876	6,555,997	16,062,192

The iron manufacture is not in a prosperous condition. In 1877 the total number of existing furnaces in England was 626, and in Wales, 145; while the total number of active ironworks amounted only to 159 in England, and 24 in Wales, showing that more than three quarters of the furnaces were standing idle.

Lead. In comparison with coal and iron, all the other mineral products of the country are of small importance. Of these minor products, the highest on the list, as to value, is lead ore, raised in *G. B.* to the value of £1,218,078 in 1876, and producing lead valued at £1,270,415 ($6,352,075). The quantities of lead ore raised in the year amounted to 79,096 tons, and the metallic produce to 58,667 tons. Of this total, 73,361 tons of ore were raised in England and Wales, producing 54,363 tons of lead. More than one half of the lead ore and lead produced in England came from the counties of Durham and Northumberland, while two thirds of the produce of Wales came from Montgomeryshire and Cardiganshire. There were altogether 392 lead-mines in *G. B.* in 1876, and of this number 387 were in England and Wales. The produce of the lead-mines, after remaining stationary for many years, has, of late, declined considerably. In the fifteen years from 1854 to 1868 the average annual produce in *G. B.* amounted to about 68,000 tons. The culminating point of production was reached in the year 1870, with 73,420 tons, after which there was a steady falling off. The decrease in the home produce of lead was accompanied by an increase in the imports of the metal, which amounted to 61,987 tons in 1874, and rose to 79,825 tons in 1875, and to 80,649 tons, valued at £1,749.978 ($8,749,890), in 1876. It will be seen that the imports of lead are considerably larger than the home production.

Tin. Tin ore is found nowhere but in Cornwall and Devonshire, and in 1877 there were returned, as existing in England, 135 tin-mines. Their produce has suffered a great and steady decrease in recent years. In 1872 there were raised 14,266 tons of ore, producing 9,560 tons of metal, valued at £1,459,990; while the year 1876 showed a falling off to 13,688 tons, producing 8,500 tons of metal, valued at £675,750 ($3,378,750). During the same period the imports of tin, in blocks and ingots, from foreign countries gradually increased. They amounted to 166,840 cwt., valued at £1,154,578 ($5,772,890) in 1872, and rose to 304,551 cwt., valued at £1,148,542 ($5,742,710) in 1876. It will be seen that while the total quantity of tin imported within the quinquennial period underwent a considerable increase, the total value not only did not augment, but actually decreased. The decline in price was probably one of the main causes of the decline in the production of tin.

Copper. Next to tin in value stands copper. The total value of copper ore raised in *G. B.* in 1876 was 79,252 tons, of which 71,756 tons were the produce of England and Wales, while 680 tons came from Scotland, and 6,816 tons from Ireland. The total amount of the metal produced from the ores was 4,694 tons, valued at £392,300 ($1,961,500). In 1855 the total produce of copper was as high as 21,294 tons, valued at £3,042,877 ($15,214,385); from that time the quantity has been gradually declining, and, as with lead and tin, the copper imports grew largely while the production diminished.

Salt and clay. The centre of the salt production in England is in Cheshire, Norwich, Middlewich, Winsford, and other places, but there are also salt-mines in Staffordshire and Worcestershire. In 1876 the total quantity of salt raised amounted to 2,273,256 tons, valued at £1,136,628 ($5,683,140), of which 854,538 tons, valued at £529,547 ($2,647,735), were exported to foreign countries, chiefly to the U. States and British India. Of clays of all kinds, the total produce in 1876 was 3,971,123 tons, valued at £744,224 ($3,721,120). The finest of the clays, known as kaolin, or porcelain clay, is the produce of Cornwall and Devonshire, the former county raising 105,275

tons, and the latter 25,000 tons, in 1876. Of importance next to it, as potter's material, is the "Poole clay" of Dorsetshire, of which 72,105 tons were produced in 1876. Raised in much larger quantities than both the kaolin and the "Poole," are the fire-clays, the production of which in the year 1876 amounted to 1,514,902 tons. The fire-clays are found chiefly in the north and west of England and in South Wales.

Cotton. The following table shows the progress, with fluctuations, of the cotton-trade, in the annual imports, the exports, and the excess of imports of raw cotton during each, for every fifth year from 1841 to 1876: —

Years.	Total Imports of raw Cotton.	Total Exports of raw Cotton.	Excess of Imports.
	lbs.	lbs.	lbs.
1841	487,992,355	37,673,585	450,318,770
1846	467,856,274	65,930,732	401,925,542
1851	757,379,749	111,980,394	645,399,355
1856	1,023,886,304	146,660,864	877,225,440
1861	1,256,984,736	298,287,920	958,696,816
1866	1,377,514,096	388,981,936	988,532,160
1871	1,778,139,776	362,075,616	1,416,064,160
1876	1,487,858,848	203,305,872	1,284,552,976

There were 2,655 cotton factories in the United Kingdom at the end of 1874. They had 41,881,789 spindles and 463,118 power-looms, and gave employment to 479,515 persons, of whom 187,620 were males, and 291,895 females. Lancashire alone absorbs three fourths of the manuf of cotton fabrics in *G. B.*, having 1,911 factories, with 373,061 power-looms, and 352,003 persons employed. (For further information and statistics, see COTTON, page 230.)

Woollen and Worsted. There were in 1876, in *G. B.*, 1,800 woollen and 692 worsted factories. In the woollen factories there were in use 3,323,881 spindles and 57,090 power-looms, and they employed 134,605 persons; while in the worsted factories there were in use 2,382,450 spindles and 81,747 power looms, and they employed 142,097 persons. Unlike cotton, the raw material for woollen fabrics is mainly produced at home; still, for many years past the native supply has been insufficient, which necessitated imports from foreign countries and British colonies, ever increasing in amount. During 1840 - 1876 the imports of wool rose from 49 to 390 millions of pounds.

The following table exhibits the imports of wool into *G. B.* from foreign countries and British colonies, the amount of re-exports, and the net balance of imports, for every fifth year from 1841 to 1876: —

Years.	Total Imports of Wool.	Total Exports (foreign and colonial).	Net Imports.
	lbs.	lbs.	lbs.
1841	56,170,974	2,553,671	53,617,303
1846	65,255,462	3,011,980	62,243,482
1851	83,311,975	13,729,987	69,581,988
1856	116,211,392	26,679,793	89,531,599
1861	147,172,841	54,377,104	92,795,737
1866	239,358,689	66,573,488	172,785,201
1871	323,036,299	134,866,304	188,169,995
1876	390,055,759	173,020,372	217,035,387

Of the 1,800 woollen factories in existence in the United Kingdom at the end of 1874, England and Wales had 480; and of the 692 worsted factories, England and Wales had 239. The chief seat of the woollen and worsted manuf. in England is in Yorkshire, while Lancashire stands second, but a long way behind.

Silk. There were in 1876, in *G. B.*, 818 silk-factories, with 1,336,411 spindles and 10,002 power-looms, employing 45,559 persons. Of this total, only 4 factories, with 226 power-looms, employing 740 persons, were in Scotland; and but 2 factories, with 7 power-looms, employing 400 persons, were in Ireland.

Linen. In 1876 there were in *G. B.* 449 factories for spinning flax, using 1,473 800 spindles and 41,980 power-looms, and employing 128,459 hands. In the returns for 1874, Scotland took the first rank as regards the number of flax-factories, Ireland the second, and England the third rank. There were in Scotland at that date 159 factories, with 275,119 spindles and 18,529 power-looms, employing 45,816 persons; and in Ireland 149 factories, with 906,946 spindles and 17,827 power-looms, employing 60,316 hands.

Hosiery, Lace, and Shoddy. There are enumerated in official returns a number of other existing factories, among them of hosiery, lace, "shoddy," hair, felt, and elastic fabrics. The hosiery factories of *G. B.* employed 11,980, and the lace factories 10,373 persons in 1874; but all the others gave employment, in the aggregate, to less than 9,000 workers. The hosiery factories were all in England, with the exception of 4 in Scotland, employing 1,006 persons. In the English hosiery factories, 65 in number, nearly all in Leicestershire and adjoining midland counties, there were 10,914 persons employed in 1874, about one half of them women. The hosiery factories of England more than doubled from 1861, when their number was 65, to 1874. The same was the case with the lace factories, which increased from 186 in 1868 to 311 in 1874. Another notable textile industry enumerated in the official returns is that of "shoddy factories." There were of these establishments, 125 in *G. B.* in 1874, all of them in England, with the exception of some very small Scottish ones, returned as employing

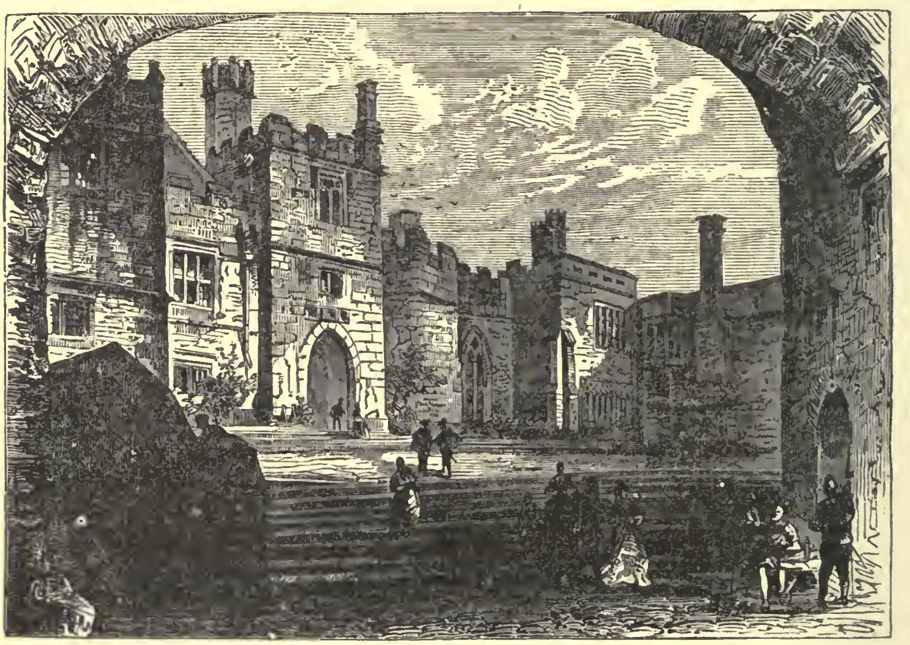


Fig. 246. — COURTYARD, HADDON HALL.

together 7 persons. The English shoddy factories, dispersed in 1874 over Yorkshire and Lancashire, with but a few in other counties, had in use in that year 101,134 spindles and 1,437 power-looms, and employed 3,424 persons, more than one half of them women. There was an increase in the shoddy factories of Lancashire from 1868 to 1874, but a decrease during the same period in those of Yorkshire.

V. Foreign Commerce.

The most important fact in connection with the foreign commerce of *G. B.*, in recent years, is that there has been a gradual and steady increase of imports, together with a decrease of exports of home produce. The movement began in 1872. Up to that time the exports of British produce had kept on increasing with the imports, although at a lower rate, and far inferior in aggregate value; but a change took place in the latter year. While the imports have continued their upward course, the exports of British produce have fallen regularly and steadily down to the present time, and with a tendency to become more pronounced every year. The decline in exports affected all the principal articles of British home produce; it was greatest of all in textile manufactures, and least in coals and machinery. The declared value of imports and exports of *G. B.* during the ten years 1868 to 1877 was as follows: —

Years.	Total Imports.	Exports of British Produce.	Exports of Foreign and Colonial Produce.	Total Imports and Exports.
	£	£	£	£
1868	294,693,608	179,677,812	48,100,642	522,472,062
1869	295,460,214	189,953,957	47,061,095	532,475,266
1870	303,257,493	199,586,822	44,493,755	547,338,070
1871	331,015,380	223,066,162	60,508,538	614,590,080
1872	354,693,624	256,257,347	58,331,487	669,282,458
1873	371,287,372	255,164,603	55,840,162	682,292,137
1874	370,082,701	239,558,121	58,092,343	667,733,165
1875	373,939,577	223,465,963	58,146,360	655,551,900
1876	375,154,703	200,639,204	56,137,398	631,931,305
1877	394,419,682	198,893,065	53,452,955	646,765,702

The following table shows the relative division of the imports and exports of British produce in each of the years 1876 and 1877: —

COUNTRIES.	Imports.		Exports.	
	1876.	1877.	1876.	1877.
I. Foreign Countries.				
Russia	£17,574,000	£22,142,000	£6,183,000	£4,179,000
Sweden and Norway	10,654,000	10,455,000	4,225,000	4,181,000
Denmark and Iceland	4,218,000	3,950,000	2,199,000	1,828,000
Germany	21,115,000	26,270,000	20,082,000	19,642,000
Netherlands	16,602,000	19,861,000	11,777,000	9,614,000
Belgium	13,848,000	12,889,000	5,875,000	5,304,000
France	45,305,000	45,823,000	16,086,000	14,233,000
Spain	8,763,000	10,842,000	3,992,000	3,637,000
Portugal, with the Azores	3,805,000	4,089,000	2,408,000	2,425,000
Italy	4,152,000	4,101,000	6,689,000	6,219,000
Austro-Hungary	856,000	1,541,000	785,000	1,042,000
Greece, with the Ionian Islands	1,799,000	2,454,000	867,000	867,000
European and Asiatic Turkey	7,444,000	6,852,000	5,923,000	5,625,000
Roumania	1,238,000	247,000	708,000	197,000
Egypt	11,482,000	11,102,000	2,630,000	2,273,000
Europe and Mediterranean countries	£168,855,000	£182,618,000	£90,429,000	£81,266,000
United States of North America	£75,899,000	£77,826,000	£16,834,000	£16,377,000
Mexico	662,000	799,000	502,000	996,000
Central America	935,000	1,380,000	716,000	930,000
Cuba and Porto Rico	2,943,000	1,505,000	2,015,000	2,244,000
Other West Indian Islands	458,000	262,000	632,000	623,000
Venezuela	55,000	64,000	679,000	620,000
Colombia	682,000	472,000	783,000	912,000
Ecuador	245,000	186,000	225,000	252,000
Brazil	5,178,000	6,345,000	5,920,000	5,959,000
Argentine Republic and Uruguay	2,505,000	2,434,000	2,550,000	3,170,000
Chili	3,585,000	3,280,000	1,946,000	1,501,000
Peru	5,631,000	4,697,000	991,000	1,266,000
America	£98,778,000	£99,250,000	£33,793,000	£34,850,000
China, without Hong-Kong	£14,939,000	£13,421,000	£4,611,000	£4,405,000
Japan	657,000	734,000	2,033,000	2,203,000
Dutch East Indies	1,441,000	1,856,000	1,676,000	2,061,000
Philippine Islands	1,443,000	1,756,000	720,000	1,292,000
Algeria	496,000	562,000	210,000	271,000
Morocco	627,000	812,000	396,000	393,000
Canary Islands	277,000	297,000	148,000	172,000
West coast of Africa	1,696,000	1,626,000	999,000	1,178,000
Other countries	1,613,000	1,834,000	758,000	879,000
Asia and Africa	£23,189,000	£22,998,000	£11,558,000	£12,854,000
Total foreign countries	£290,822,000	£304,866,000	£135,780,000	£128,970,000
II. British Possessions.				
Channel Islands	£676,000	£724,000	£586,000	£555,000
Gibraltar	50,000	70,000	1,121,000	869,000
Malta	214,000	286,000	894,000	819,000
Colonies in North America	11,024,000	12,036,000	7,358,000	7,614,000
West Indies, Honduras, and Guinea	7,122,000	7,129,000	3,045,000	3,007,000
Australia and New Zealand	21,962,000	21,732,000	17,682,000	19,286,000
East Indies	30,025,000	31,225,000	22,405,000	25,338,000
Singapore	2,642,000	2,722,000	1,949,000	2,276,000
Ceylon	3,134,000	4,499,000	1,074,000	1,015,000
Hong-Kong	1,357,000	1,895,000	3,080,000	3,508,000
Mauritius	937,000	1,891,000	342,000	493,000
Colonies in South Africa	4,192,000	4,275,000	4,339,000	4,116,000
British West Africa, and Islands	681,000	768,000	719,000	810,000
Other possessions	317,000	302,000	215,000	187,000
Total British possessions	£84,333,000	£89,554,000	£64,859,000	£69,923,000
Total imports and exports	£375,155,000 $1,875,775,000	£394,420,000 $1,971,100,000	£200,639,000 $1,003,195,000	£198,893,000 $994,465,000

The commerce of *G. B.* with the U. States for the year 1878 was as follows: —

Exports of Home and Colonial Produce to the United States.

	England.	Scotland.	Ireland.
	$	$	$
Argols	126,631	....	....
Barks	165,984	....	....
Beer, ale, and porter	438,131	32,245	46,104
Bleaching-powder	574,954	20,353	2,474
Books	1,156,568	71,732	....
Breadstuffs, — rice	276,135	....	....
Buttons of all kinds	514,016	3,971	....
Chemicals, etc	2,487,660	245,075	....
Coal (bituminous)	492,537	58,348	580
Cochineal	277,748	....	....
Coffee	273,507	....	....
Copper, manuf.	288,731	496	212
Cordage, rope, and twine	101,886	....	....
Cotton, raw	337,490	....	....
" manuf., white	776,186	159,594	5,271
" " printed	816,974	42,727	383
" " hosiery, shirts, etc.	1,132,757	1,359	....
" " notsp'cified	5,197,914	2,091,888	12,000
Earthen, stone, and china ware	3,066,272	15,751	332
Fancy goods	1,778,643	17,639	....
Flax, raw	108,171	76,220	332,510
" manuf	7,756,562	4,033,921	1,317,699
Fruits and nuts	2,102,204	13,147	....
Fur skins, undressed	517,195	6,118	....
" dressed, and furs	938,422	26,400	....
Glass, cast polished plates	126,317	....	....
Gold and silver: —			
Gold bullion	847,723	....	....
" coin (foreign)	1,107,573	....	....
" " (American)	5,236,281	....	....
Silver bullion	5,165,714	....	....
" coin (Am.)	193,969	....	....
Gums	624,147	....	....
Hair, manuf.	127,600	....	....
Hides and skins	2,923,576	10,101	....
Household and personal effects	109,872	1,475	77
India-rubber	784,314	....	....
" manuf.	175,797	35	....
Indigo	338,670	....	....
Iron, pig	472,830	186,986	....
" bar	1,333,279	6,669	....
" machinery	534,641	9,251	3,062
" firearms	270,225	16	....
" steel ingots, sheets, etc.	1,138,419	119	....
" cutlery	827,677	92	....
" files	108,621	....	....
" manuf., not specified	1,589,218	14,221	....
Jute, manuf. of	600,296	297,105	....
Lead, pig and bar	142,031	....	....
Leather of all kinds	653,737	7,653	....
" gloves	583,457	276	....
" manuf., not specified	218,018	427	....
Marble and manuf. of	72,282	116,059	111
Metal composition, manuf.	221,868	9,835	1,546
Oil, volatile	148,386	....	....
Opium	1,228,977	....	....
Paintings, chromos, etc.	229,623	311	....
Paints, white lead	107,727	....	....
" not specified	342,500	3,844	....
Paper materials (rags, etc.)	2,003 198	160,524	....
" divers man. of	331,039	41,635	216
Perfumery	115,798	3,044	....
Precious stones	1,214,511	....	....
Salt	1,198,426	629	....
Seeds	233,313	1,214	....
Silk, raw	526,252	....	....
" dress and piece goods	1,126,841	9,243	2
" manuf., not specified	1,614,418	4 501	886
Soda, carbonate	3,127,876	200,018	....
" caustic	1,037,423	22,161	....
Spices of all kinds	349,608	....	....
Straw and palm-leaf, manuf	350,067	....	....
Sugar, brown	171,512	....	....

Exports. — Continued.

	England.	Scotland.	Ireland.
	$	$	$
Tin, in plates	9,561,742	110	....
Wines and spirits: —			
Spirits	258,058	60,473	1,568
Wines	470,805	736	....
Wood, cabinet-ware	163,542	4,342	54
Wool, unmanufactured	3,750,762	....	....
" cloths and cassimeres	3,616 344	9,509	....
" shawls	738,346	71,867	....
" carpets	329,058	42,558	....
" dress goods	7,134,246	39,977	72
" hosiery	336,890	17,547	....
" manuf., not specified	1,734,904	14,005	62
All other articles under $100,000 each	7,853,625	77,874	43,360
Total exports	$109,621,257	$8,452,849	$1,768,579

Imports of American Domestic Produce.

	England.	Scotland.	Ireland.
	$	$	$
Ag. implements: —			
Mowers and reapers	354,231	41,715	....
Not specified	241,644	24,770	....
Animals (living): —			
Horned cattle	2,327,003	81,840	....
Horses	529,665	50,100	....
Books	181,014	7,841	....
Breadstuffs: —			
Barley	1,193,471	261,876	845,328
Indian corn	16,683,360	1,774,511	19,291,355
Oats	107,597	1,456	....
Wheat	38,467,534	2,649,374	32,721,633
Wheat flour	7,328,200	2,265,943	175 925
Small grain and pulse	345,907	118,571	....
Maizena, farina, etc.	811,708	598,840	....
Carriages, cars, etc.	141,039	4,937	....
Clocks	427,891	63,985	....
Cotton (raw) Sea Island	1,261,630	....	....
" " other	110,677,992	....	5,491,420
" (manuf.) colored	334,004	11,559	....
" uncolored	991,422	72,899	....
" not specified	148,169	14,481	400
Drugs, chemicals, etc.	480,333	25,071	....
Fancy articles	241,039	4,632	....
Fruits: apples	204,584	82,670	100
" in cans	158,561	8,290	....
Furs and fur skins	1,939,080	....	....
Gold and silver: —			
Gold coin	3,359,841	....	....
Silver bullion	6 254,191	....	....
" trade dollars	893,515	....	....
Hair, unmanufactured	258,851	....	....
Hemp, manuf. of	422,679	236,764	81,935
Hides and skins	283,986	2,925	5 668
Hops	2,032,659	43,456	....
Iron and steel: —			
Machinery	641,942	78,911	....
Manuf., not specified	258,086	13,796	....
Edge-tools	228,850	12,152	....
Leather of all kinds	3,723,909	67,495	....
" Morocco	793,248	1 907	....
" Man. not specified	89,022	32,392	....
Manures	786,336	24,752	141,679
Marble and stone man.	259,217	8,085	72,585
Musical inst.: organs	148,643	6,375	....
Naval stores: rosin and turpentine	714,142	180,890	18,915
Oils: —			
Oil cake	3,905,051	261,086	739 505
Naphthas (benz., etc.)	695,192	....	28,522
Illuminating	4,352,053	74,219	792,943
Lubricating	192,797	29,731	....
Tar, pitch, etc.	234,297	34,892	....
Lard	555,204	186,954	....
Sperm	615,141	175,822	....
Whale	100,040	40,928	....
Volatile	201,242	6,100	....
Paint'gs and engrav'gs	126,836	2,890	....
Paper and stationery	149,548	9,033	....
Provisions: —			
Bacon and hams	33,806,885	4,376,066	58,700
Beef, salted and cur'd	1,663,050	455,799	143
" fresh	4,102,747	863,405	....
Butter	1,729,174	921,396	....
Cheese	12,184,622	1,567,263	7,500
Cured fish	1,919,703	....	....

Imports. — Continued.

	England.	Scotland.	Ireland.
	$	$	$
Lard	7,934,320	2.241,155	....
Preserved meat	3,212,469	1,072,048	....
Oysters	252,999	1,816	....
Pork	1,548,733	169.269	121
Seeds, cotton	164,185	95	....
" all others	609,199	171.592	3.500
Sewing-machines	465,977	16,597	....
Spirits of turpentine	1,271,857	119,847	256,748
Sugar, refined	1,653,606	182,184	....
" molasses	117,478	198 498	....
Tallow	2,621,423	551.566	....
Tobacco, leaf	7,546,813	653,991	....
" man. not specified	841,696	106.127	....
Whalebone	105,869	1,765	....
Wood: —			
Boards, deals, etc,	677,477	155,901	101.626
Shooks, staves, etc	329,599	71.777	39.353
Other lumber	158,267	37,987	1,776
Timber	1,245,712	144.569	215,265
Household furniture	115,708	47.424	....
All other manuf	401,395	245.645	....
All other articles under $100,000 each	4,724,676	630,182	109.246
Total imports	$307,319,235	$24,721,880	$61,201,791

The subjoined tabular statement shows the commercial intercourse between *G. B.* and the U. States in each of the 20 years, 1859 to 1878: —

Years.	Imports from the U. States.		Total imports.	Exports to the U. States.
	Domestic.	Foreign.		
	$	$	$	$
1859	172.155,786	2,790,067	174,945,853	125 754,421
1860	196.260,756	6,080,165	202,340,921	138,596,484
1861	116,583,955	3,951,968	120,535,923	139,206,367
1862	105,898,554	4.699,602	110,598,156	86,481,430
1863	166,466,101	13,310,416	179,776,517	113.136,700
1864	167,019,543	6,531,925	173,551,468	143,195,714
1865	124,410.338	15,319,869	139,730,207	85,332.482
1866	337,684,689	4,593,769	342,278,458	202,440,242
1867	247,225,717	6,717,138	253,942,855	178,915,255
1868	238,085,761	5,695,788	243,781,549	133,168.139
1869	201,799,754	5,390,165	207,189,919	163.195,656
1870	267,499,781	11,665,086	279,164.867	155,043,872
1871	344,632,550	13,573.703	358,206,253	220,880,367
1872	313,195,069	8,490,972	321,686,041	249.325.957
1873	363,509,205	11,703,694	375,212,899	237.796,788
1874	373,566,508	7,587,644	381,154,152	193,595,330
1875	366,799,869	4,945,813	371,745,682	157,047,827
1876	361,536,524	7.363,800	368,900,324	124,852.964
1877	365,676,732	9,792,260	375,468,992	135.138,260
1878	393,242,906	5,768,480	399,011,386	119,842,685
Total	5,223,250,098	155,972,324	5,379,222,422	3,102,946,940

The six principal articles of British produce exported to colonial possessions and foreign countries in the years 1875, 1876, and 1877, were as follows: —

Principal articles.	1875.	1876.	1877.
1. Cotton manufactures: —	£	£	£
Piece goods, white or plain	33,255,013	31,454,280	31,809,747
" printed or dyed	19,900,918	18,494,492	20,218,715
" of other kinds	5,442,922	4,910,763	5,007,567
Cotton yarn	13,172,860	12,781,733	12,192,954
Total of cotton manuf	71,771,713	67,641,268	69,226,983
2. Woollen and worsted man.			
Cloths, coatings, etc	6,850,203	6,451,410	6,567,806
Flannels, blankets, and baizes	1,239,637	1,014.886	1,176 377
Worsted stuffs	11,159,914	9,141,605	7,725,414
Carpets and druggets	1,159,979	911,873	847,763
All other sorts	1.249,592	1,083,704	1,025,843
Woollen and worsted yarn	5,099,307	4,417,241	3,609,456
Total of woollen and worsted manuf.	26,758,632	23,020,719	20,952,659
3. Iron and steel: —	£	£	£
Iron, pig and puddled	3,449,916	2,842,434	2,528,655
" bar, angle, bolt, and rod	2,725,907	1,945,445	1,928,103
" railroad, of all sorts	5,453.836	3,700,105	3,868,106
" wire	780,037	731,148	752,278
" tinned plates	3,686,607	2,891,693	3,033.126
" hoops and plates	3,304,148	2.853,621	2.732,313
" wrought, of all sorts	4,342,492	4,041,418	3,645,661
" old, for re-manuf	102,837	95,977	100,788
Steel, wrought and unwrought	1,901,491	1,635,569	1,524,885
Total of iron and steel	25,747,271	20,737,410	20,113,915
4. Coals, cinders, and fuel	9,658,088	8,904,463	8,351,799
5. Linen manufactures: —			
White or plain	5,904,958	4,365,072	4,597,665
Printed, checked, or dyed	470,295	449,918	471,982
Of other sorts	897,667	805,646	764,796
Linen yarn	1,855,684	1,449,513	1,509,153
Total of linen manuf	9,128,604	7.070,149	7,343,596
6. Machinery	9,058,647	7,210,426	6,722,868

The tendency of modern English legislation is towards concentration of customs duties on a few articles. At present there are virtually but four great articles of customs produce, namely, tobacco, spirits, tea, and wine. The receipts of the customs were as follows in each of the years 1876 and 1877: —

Articles.	Gross produce of customs duties.	
	1876.	1877.
	£	£
Chicory	62,889	66,004
Cocoa, cocoa-husks, and chocolate	44.953	43,508
Coffee	208,467	205.272
Fruit, dried: currants	340,179	286,114
" figs, plums, and prunes	44,506	40.190
" raisins	150,434	152.649
Spirits: rum	2,554,260	2,509.775
" brandy	2.341.120	2,135.135
" geneva and other sorts	1,065,157	865,228
Tea	3,728,311	3,781,891
Tobacco and snuff	7,838.048	8,080,781
Wine	1,764,128	1,660,157
Other articles	13,856	13,617
Total gross receipts	20,156,308	19,840,321
Deduct drawbacks and repayments	101,610	104,110
Total net receipts	20,054.698 $100,273,490	19,736,211 $98,681,055

The decline of English manufacture and commerce may be attributed partly to the badness of English work and partly to the faults both of master and man, which have caused the high price of production. To these should be added certain results of the existing laws of England, which necessarily affect the price of production. One of those is *the high price of land*, arising from its absorption by a few owners (see above), which results in increased rents for manufactories, and, therefore, in the necessity of selling a much larger quantity of goods before any actual profit can be made. Here, France, Germany, and Belgium — without for the present speaking of this country — have the advantage over England. The delegates of the British Chamber of Commerce who went to France, in 1879, to report on the French industries in view of the prospective revision of the French tariff, found that the French woollen mills, for instance, could be erected for less money than English, and that though the machinery and fuel may be dearer, the mode of working is much more economical. French mill-hands work as a rule 72 hours a week instead of 56½, as in England, and receive for that in some cases only $100 where $200 would be paid in England, while $150 to $200 is a very common difference. Quite as much work in the time is got out of the French workman as out of the English, and as regards managers, overlookers, designers, dyers, and foremen, the French have the advantage, as they are better educated and have a more cultivated taste than the corresponding classes of English artisans. The chief fault of the manufacturers is their *conservatism*. They prefer to stick to old processes and

old models, and are unwilling to please or suit the tastes of their customers. They seem to forget that variety is the order of the day, and that in stuffs nothing remains in fashion long. They have shown more yieldingness in the patterns of stuffs which they have made for the Eastern and Asiatic markets; but even here they have tried too much to impose their own ideas on the natives, and Russian and German goods at the same price are usually preferred, and in some cases even sell at higher prices. The French are much quicker to catch the feeling of change in the air, either by taking advantage of a pattern which is about to prevail or to introduce one. The consequence is that French manufacturers are constantly making slight alterations in their machinery, by which they produce new stuffs; and the world is now so united that what is the fashion in France speedily becomes so in England. English manufacturers, on the contrary, look to the great cost which would be incurred by changing their machinery, and frequently continue producing articles which do not sell at the time in the hope that some day they may again satisfy public taste. Another example of the conservatism of the English manufacturer is manifested in the preference for hand work to machine work. In many respects hand labor is superior to machine labor, where it is perfectly well done. But in cases where hand labor is thoroughly well performed the articles become too expensive to compete with those of a similar kind made by machinery. The excellence of machine work is exemplified in the manufacture of watches made by this method, and which are so good as to be equal, if not superior, to the very best hand work: and in the ordinary articles made by hand, especially in the metal works, there is a great deal of "scamping," and there is also a "roughness" and an inelegance which do not appear in the machine-made articles. Articles made by hand may be, though they are not really always, more durable than those produced by machinery; but modern life is such that there are many things in common use which are perhaps better for not being too durable at the expense of elegance and convenience. One great obstacle to the efficiency of labor, and consequently to good work and cheap work, is the existence of *trade-unions*. Now, of course, no one wishes the men to get less for their work than they can, or that can be properly paid to them, having regard to the interests of all. But at the same time life is a constant struggle for existence and this is nowhere more noticeable than in the competition of manufacturers. Trade-unions, therefore, by disorganizing labor, by preventing men from working who are willing to do so because they are thrifty and live for less than men who drink and squander away their wages, by insisting upon bad workmen being paid the same wages as good men, increase the cost of production in countries where they exist, as compared with others where there are no such combinations, and in that way finally do harm to the very people whom at first they appear to benefit. Trade-unions in England have brought about high wages — far too high for the times — and a decrease of working hours. During the time when trade was particularly flourishing, and when nearly all the manufacturers were making money, many employers of labor gave bonuses to their workmen, which they now find it impossible to continue. This has caused discontent among the workmen, who cannot see why they should not receive the same pay in bad times as in good. Where they refuse to accept a reduced scale of wages it necessitates either the closing of the factories or the reduction of the working time per week; it is found impossible to gain profits by making the usual quantity of goods in a dull time with such high wages for the production of them. In many cases it is a small section of the workmen who thus close the mills and throw very many others out of employment. If, for instance, spinners in a cotton-mill strike, there is nothing for the weavers to do, and no use of the preparers working. The whole business must come to a standstill. While philanthropists everywhere have supported *the short hour movement*, — on the ground that it affords laborers an opportunity for recreation and self-improvement — they have not noticed that the ultimate consequences have been worse for the laborer, who does not, as a general rule, devote the hours which were formerly occupied with work in purposes of self-improvement, but, at all events in England, has passed them in idleness or dissipation. With the rest of the world working 11 or 12 hours a day, it is impossible for the English laborers to work 9 or 10, and in any successful degree compete with their rival artisans. The normal time of working is now 10 hours a day in most factories, and 6 hours a day in coal pits and mines. But at present, owing to the small amount of manufacturing going on, these hours are very much shortened, and in many cases they are reduced by the men themselves, who, besides very frequently refusing to work on Mondays, — not having sufficiently recovered from their debauch of the day before, — constantly remain away for a week at a time. Saturday, too, is a half-holiday, when not more than 6½ hours can be required. Continental workingmen work regularly 12 hours a day, six days in the week, and by a proportionate increase of pay can be induced to work over hours and on Sundays. The English workman is too generally obstinate, idle, drunken, unwilling to adopt new ideas, and seems to try to do the minimum of work in the maximum of time. One of the worst results of the difficulties between masters and men has been occasioned by the introduction of "piece work," which at first appeared favorable for both parties, inasmuch as it enabled the employer to pay for no more work than was absolutely done, and, on the other hand, induced the men to be more industrious through a desire to finish one piece and be paid for it, instead of simply working on time. Now, however, it seems to be admitted that though in some cases it would be difficult to return to the previous system, piece work is almost always uniformly bad. It is found especially in the manufacture of prints and stuffs that the work is much worse done than under the old system,

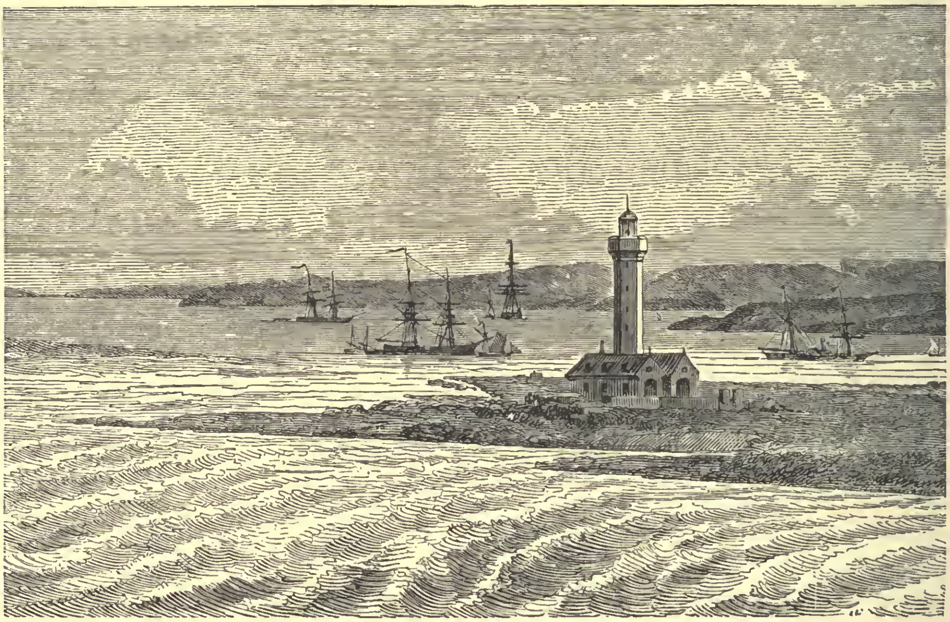


Fig. 247. — Mouth of the Avon.

although there may be more of it. Under the time system the workman was always willing to stop the machine to correct flaws and take up threads, whereas under the piece system not even the strictest surveillance is capable of making him do this. He is anxious to get through his quantity, and stopping the machine would delay him, and he cares little what the quality of his work may be. We have spoken of the heaviness, ugliness, and want of finish of the English work; but the greatest objection now urged against English manufactures is their actual badness. Cotton goods are made with so much *size* that they will scarcely bear being washed once, and, as was seen by a recent legal trial in London, become mildewed and spoiled in the course of a journey from England to China. Formerly the size was 10 per cent of the stuff in cotton goods; now it is 72 per cent. Woollen goods are made in the same bad way, the thread being rough and coarse and filled in with *shoddy* And the worst of it is that the English laws are so peculiar that it is difficult to find any remedy.

This country seems marked out by nature for the industrial supremacy which has so long been held by *G. B.* Her peerless position as queen of the seas has contributed, in no small degree, to her industrial supremacy: but the U States could in a few years dwarf her to a subordinate rank as a manufacturing nation, if we possessed her established lines of communication with all parts of the world, and her consequent cheap access to every important market. In order to command distant markets, two things are necessary, — first, the ability to produce cheap goods, and second, cheap transportation. We are already abreast of England in the cheapness, and ahead of her in the quality of our manufactures; but the abundance of her shipping, and the regularity and frequency of her great lines of steamships, make their trips to all markets of any consequence, to undersell us in many markets, and may continue to do so for some time to come. American cotton fabrics laid down on a wharf at Boston are cheaper (quality being compared with quality) than British cotton fabrics laid down at a wharf at Liverpool; but the Liverpool shipper pays, on an average, not more than half the amount of freight which it costs the Boston shipper to transport his goods to distant markets. But even with the great disadvantage of our crippled navigation interest, we are, to use Mr. Gladstone's striking expression in his "Kin Beyond the Sea" pamphlet, passing British industry "on a canter." We are effectually shutting her out of our own extensive market, — the most valuable single market she ever possessed, — shutting her out by the achieved excellence and cheapness of our manufactures in cotton, in wool, in leather, in iron, in tools, machinery, and agricultural implements. English political economists say that the loss of our markets for England is owing to our high tariff. It may be partly true, but the best reason is that we have come to make better goods, and are able to sell them at prices with which she cannot compete. The U. States market is irretrievably lost to her, thanks to the inventive skill of our mechanicians, the abundance of our native raw materials, the new economies practised by our mill-owners, the excellence of our products, and their better adaptation to the wants of our own consumers.

VI. Shipping.

The shipping of *G. B.* increased sixfold in the period from 1840 to 1877. In the year 1840 the total tonnage of the vessels, British and foreign, which entered at ports of *G. B.* was 4,657,795; and in the year 1850 it had risen to 7,100,476, while in 1860 the total tonnage was 12,172,785. The rise continued uninterrupted, as will be seen from the following table, which shows that the number and tonnage of sailing vessels is proportionally decreasing, and that of steamers increasing to such an extent that steam vessels appear likely to absorb the whole international commerce of the country: —

Years.	Entered.			Cleared.		
	British.	Foreign.	Total.	British.	Foreigu	Total.
1. Total number entered and cleared: —						
1860	6,888,000	5,284,000	12,172,000	7,026,000	5,491,000	12,516,000
1874	14,834,000	7.535,000	22,369.000	15,256,000	7,804,000	23,060,000
1875	15.191,000	7.502.000	22,693,000	15.754,000	7,830,000	23,584.000
1876	16,512,000	8,555,000	25.067,000	16,930.000	8,788,000	25,718,000
1877	17,281,000	8,340,000	25,621,000	17,485,000	8,425,000	25,910,000
2. Laden ships entered and cleared: —						
1860	5,761,000	4,294,000	10,055,000	6.359.000	4,426 000	10,783.000
1874	12,751,000	6,330,000	19.081,000	14,011,000	5 742,000	19,753 000
1875	12,852,000	6,188,000	19,040,000	14,455.000	5.959,000	20,414,000
1876	13,672,000	7,355,000	21,027,000	15.202.000	6.309.000	21,511,000
1877	14,894,000	7,237,000	22,131,000	15,358,000	5,837,000	21,195,000
3. Steamers entered and cleared: —						
1860	2,145.000	404,000	2,549,000	2,042,000	377,000	2,419,000
1874	9,555,000	1,871,000	11.426,000	9,853,000	2,001.000	11,854,000
1875	10,382,000	1,996,000	12,324,000	10,604,000	2,184,000	12.788,000
1876	11,205.000	2,155,000	13,360,000	11,459,000	2,349,000	13.808,000
1877	11,860,000	2,277,000	14,137,000	11,921,000	2,396,000	14,317,000

The subjoined Table shows the total Number and Tonnage of the Commercial Navy at the beginning of 1877 *and* 1878.

CLASSES OF SHIPS.	Sailing Vessels.		Steamships.		Total.	
	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.
Number of ships registered: —						
United Kingdom 1877	21.144	4.257.000	4,335	2,005.000	25.479	6.262.000
United Kingdom 1878	21,169	4,261,000	4,564	2,139,000	25,733	6,400,000
Number of vessels used in 1878 (exclusive of river steamers): —						
Coasting	10.642	698 000	1,323	241,000	11.965	939.000
Coasting and long-voyage	1,167	179.000	255	109.000	1,422	288,000
Long-voyage	5.292	3,261,000	1,640	1,627,000	6,932	4,888,000
Total, 1878	17,101	4,138,000	3,218	1.977.000	20.319	6,115,000
British colonies, 1878	32,566	5,841,000	5,682	2,292,000	38,248	8,133,000

The total tonnage of *G. B*, far larger than that of any other country, represents by itself more than one third of the shipping of all the maritime states of the world.

The following table shows the number and cargo-tonnage of British vessels which entered and cleared the ports of the U. States in 1878: —

British vessels from and for	Entered.		Cleared.	
	Vessels.	Tons.	Vessels.	Tons.
Sailing vessels.				
England	2,615	2,576,517	2,812	3,785,112
Scotland	285	347,104	283	444,415
Ireland	719	67,615	1,842	1,117,339
Steamers.				
England	789	2,208,150	908	2,535,858
Scotland	109	320,239	128	359,516
Ireland	3	....	15	24,123
Total	4,520	5,519,625	5,988	8,266,363

The following table shows the number and cargo-tonnage of American vessels which entered from, and cleared for, the British ports in 1878: —

American vessels from and for	Entered.		Cleared.	
	Vessels.	Tons.	Vessels.	Tons.
Sailing vessels.				
England	310	357,836	353	451,302
Scotland	8	1,278	25	14,286
Ireland	32	8,366	103	79,073
Steamers.				
England	33	102,374	34	105,507
Scotland	....	....	....	....
Ireland	....	....	....	....
Total	383	469,854	515	650,168

Ship-building has long been an industry of great importance in *G. B.*, although of late years it has suffered considerable fluctuations. The principal centres of the industry in England are the Thames, the Tees, the Tyne, and Sunderland on the east coast, and Liverpool, Barrow, and Whitehaven on the west. A very large proportion of vessels built in recent years are constructed of iron, with the consequence that the ship-building trade has mostly settled in those parts of the coast that are nearest to the iron and coal fields. In 1874 the total amount of shipping built in England reached 277,984 tons; in 1875, 220,036 tons; and in 1876, 189,840 tons. In Scotland there were built 166,214 tons, and in Ireland 4,311 tons, in 1876. The numbers do not include ships built on foreign account.

VII. Railroads.

From the opening of the first railroad, in 1825, till the end of 1850, a period of a quarter of a century, 6,621 m. of lines were constructed in *G. B.*, being at the rate of 265 m. per annum. At the end of 1860 the length of lines opened for traffic was 10,433, showing an increase of construction at the rate of 381 m per annum. In 1878 there were 16,872 m. open for traffic, the increase presenting an average of 410 m. per annum of the total length. Of the total length of lines open in 1878 there belonged to England and Wales 11,989 m , to Scotland 2,726 m., and to Ireland 2,157 m The following table gives the length of lines open, the capital paid up, the number of passengers conveyed, and the traffic receipts of all the railways of *G. B.* in each of the ten years from 1868 to 1877: —

Years	Length of lines open at the end of each year.	Total capital paid up (shares and loans) at the end of each year.	Number of passengers conveyed (exclusive of season-ticket holders).		Traffic receipts.	
			Total.	Pr. m.	Total.	Pr. m.
	Miles.	£	No.	No.	£	£
1868 ...	14,628	511,680,855	304,136,334	21,961	40,912,534	2,875
1869 ...	15,145	518,779,761	305,664,285	20,189	42,695,321	2,712
1870 ...	15,537	529,908,673	330,004,398	21,518	45,078,143	2,794
1871 ...	15,756	552,680,107	375,220,754	24,025	48,892,780	3,063
1872 ...	15,814	569,047,346	422,874,822	26,740	51,304,114	3,244
1873 ...	16,082	588,320,308	455,320,288	28,332	55,675,421	3,462
1874 ...	16,449	609,895,919	478,316,701	29,080	56,901,281	3,459
1875 ...	16,658	630,226,942	507,532,187	30,470	58,982,753	3,541
1876 ...	16,872	658,214,776	538,681,722	31,928	59.917,868	3,551
1877 ...	17,077	674,059,048	551,593,654	32,301	62,973,328	3,687

To the total capital in 1877 England and Wales contributed £557,878,925, Scotland £84,924,763, and Ireland £31,255,360. In the division of the traffic receipts of 1877, England and Wales took £53,057,499, Scotland £7,110,228, and Ireland £2,805,601. The working expenditure amounted to £33,857,978 on all the railroads in 1877, being 54 per cent of the total traffic receipts. The following tabular statement gives the total length of railroads open for traffic in the British Empire at the beginning of 1878: —

		Miles.	Miles.
United Kingdom			17,092
India		7,324	
Ceylon		92	
Dominion of Canada		5,574	
Jamaica		25	
British Guiana		21	
Australasia	New South Wales.... 650		
	Victoria 931		
	South Australia..... 292		
	Queensland......... 298		
	Tasmania........... 175		
	New Zealand........ 718		
Total, Australasia		3,064	
Cape Colony and Natal		154	
Mauritius		66	
Total of Colonial Empire of Great Britain			16,320
Total, British Empire			33,412

The construction of railroads in England was undertaken originally by a vast number of small companies, each obtaining separate acts of Parliament deemed requisite for their existence. But many years did not elapse before it was discovered that there could be neither harmonious nor profitable working of a great many systems, and this led to a series of amalgamations, by which the majority of the lines were brought under the management of a few great corporations In the official "Railway Returns," issued by the Board of Trade, there were still 92 independent companies enumerated as existing in England and Wales in 1877, but the mass of these consisted of very small undertakings. Virtually the railroads of the country were controlled by seven leading companies, as follows: —

Railroad Companies	Seat of Management.	Length of System, 1877.
		Miles.
Great Western	London	2,058
London and Northwestern	London	1,632
Northeastern	York	1,429
Midland	Derby	1,238
Great Eastern	London	859
London and Southwestern	London	687
Great Northern	London	640

The seven great railroad companies here enumerated — which might be reduced to six, the Northeastern and Great Northern practically forming a united system — held between them 8,543 m in 1877, representing nearly all the main lines of the country. It seems probable that, with the exception, perhaps, of two or three companies south of the Thames, possessing, in the communication with the continent, an independent traffic, all the others will gradually follow the process of absorption, more and more strongly developed in recent years. It may be that the process will ultimately reach its furthest solution by all the railroads being placed by purchase, the same as the telegraphs, under the sole control of the government.

VIII. Finances.

The finances of *G. B.* are in the most satisfactory condition. Not only is the national revenue requisite to meet the expenditure raised with the utmost facility, but for many years the balance of them has been complete, an annual surplus being the rule, and a deficit the exception, in most financial periods. The subjoined table shows the total revenue and expenditure of the government, together with the proportion of receipts per head of population of the United Kingdom, in every fifth financial year from 1841 to 1871, and each year thereafter to 1878: —

Years.	Total revenue.	Total expenditure.	Proportion of revenue per head of population.		
	£	£	£	s.	d.
1841	47,433,399	49,285,396	1	15	9
1846	52,009,324	49,628,724	1	17	5
1851	53,057,053	49,882,322	1	18	6
1856	65,704,491	88,428,345	2	10	7
1861	70,283,674	72,792,059	2	8	10
1866	67,812,292	65,914,357	2	5	1
1871	69,945,220	69,548,539	2	4	5
1872	74,708,314	71,490,020	2	7	3
1873	76,608,770	70,714,448	2	8	2
1874	77,335,657	76,466,510	2	8	2
1875	74,921,873	74,328,040	2	6	3
1876	77,131,693	76,621,773	2	7	1
1877	78,565,036	78,125,227	2	7	6
1878	79,763,299	78,903,495	2	7	8

The following table gives the official account of the gross sources of revenue for the financial year 1878: —

Revenue.		*Expenditure.*	
Customs	£19,969,000	National Debt	£28,000,000
Excise	27,464,000	Floating Debt	411,923
Stamps	10,956,000	Civil List	406,710
Land Tax, etc.	2,670,000	Other Charges	1,234,875
Income Tax	5,820,000	Army	14,607,445
Post-Office	6,150,000	Army Purchase	504,720
Telegraphs	1,310,000	India Charges	1,000,000
Crown Lands	410,000	Navy	10,978,592
Interest on Advances and on the Purchase-Money of Suez Canal shares	949,884	Civil Service	13,982,553
		Customs and Collection	2,688,267
		Post-Office	3,185,346
		Packet Service	763,000
Miscellaneous	4,064,415	Telegraphs	1,157,000
Total	£79,763,299 $398,816,495	Total	£78,903,495 $394,517,475

About three fourths of the total revenue of *G. B.* are derived from three sources of income, — excise, customs duties, and stamps. In the sixteen financial years from 1862 to 1877, the revenue from the excise increased greatly, and that from customs declined, while that from stamps increased moderately. The following table shows the receipts from these main sources of revenue for every third year from 1867 to 1877: —

Years.	Excise.	Customs.	Stamps.
	£	£	£
1862	18,332,000	23,674,000	8,590,945
1865	19,558,000	22,572,000	9,530,000
1868	20,162,000	22,650,000	9,541,000
1871	22,783,000	20,191,000	9,007,000
1874	27,172,000	20,339,000	10,550,000
1877	27,736,000	19,922,000	10,890,000

Excise. The vast increase in the receipts from the excise was due solely to the corresponding increase in the consumption of spirituous liquors. The increase was greatest in the receipts from spirits, which rose from £9,618,291 ($48,091,455) in 1862 to £14,873,165 ($74,365,825) in 1877. The excise receipts from malt grew from £5,866,302 ($29,331,510) in 1862 to £8,040,378 ($40,201,890); and those from licenses to make and sell spirits and malt liquors from $1,500,613 ($7,503,065) in 1862 to £3,548,557 ($17,742,785). In the latter financial year the receipts from the excise had come to represent already considerably more than one third of the total revenue, and should the growth, very steady and regular from year to year, continue at the rate shown in the preceding table, it will not be long before one half of the national income will be raised by the voluntary taxation of the consumers of alcoholic liquors.

Customs. The decline in the receipts from customs during the period 1862 to 1877 was mainly due to a constant reduction of duties. Those of tea were reduced in 1862, causing a loss to the revenue of £1,641,541: and again in 1864, when the loss was £2,214,981. The duties on sugar were also greatly reduced in 1863, the loss to the customs being £1,741,272; and again in 1872, with a loss of £1,612,882; while the small remnant of the old duties on corn was repealed in 1868, at a loss of £855,-581: and the example was followed in the case of the sugar duties, the last of which was abolished in 1875. Thus the sugar duties, producing £6,383,289 in 1862, brought nothing in 1877, while the tea duties fell from £5,516,584 to £3,723,147 Alone of all the customs duties, those on foreign spirits and wine increased during the period, notwithstanding the latter article also underwent a reduction of duties. Together, the foreign wine and spirits duties produced £3,753,785 in the financial year 1840-41, and £7,507,807 in 1876-77. Adding this sum to the excise receipts, the total revenue derived from spirituous liquors in the financial year 1877 was no less than £35,243,807 ($176,219,053), or nearly three sevenths of the national revenue.

The indication of the proportions of the revenue derived from taxation in England, Scotland, and Ireland respectively is shown in the following table. The figures, which are for the financial year 1877, do not include the post-office returns, and in the case of the income tax are exclusive of the returns from the incomes of government officials: —

Revenue, 1876-77.	England.	Scotland.	Ireland.
	£	£	£
Spirits	13,078,101	4,056,331	3,507,985
Malt	7,220,089	358,343	451,950
Wine and beer (customs)	1,894,856	124,309	211,078
Excise licenses	3,034,395	308,599	205,563
Tobacco	6,014,114	737,227	1,024,234
Tea and coffee	3,206,765	322,156	394,644
Land and house duty	2,404,792	133,382	......
Income tax	4,342,410	518,149	269,889
Stamps	8,581,581	1,110,807	589,173
Miscellaneous items	1,324,787	77,910	10,208
Total	£51,101,890	£7,757,213	£6,664,724
Per head of pop	£2 1s. 8½d. $10 42	£2 3s. 6¾d. $10.87½	£1 4s 11¾d. $6.23½.

National Debt. Leaving alone the cost of the army and navy, the charges for the interest and management of the debt form by far the most important branch of national expenditure The foundation of this debt, larger than that of any other country in the world, was laid at the time of the revolution, in 1689, and its growth since that time, both as regards capital and interest, is shown in the following table: —

Historical Periods.	Capital of Debt.	Interest and Management.
	£	£
Debt at the Revolution, in 1689	664,263	39,855
Excess of debt contracted during the reign of William III. above debt paid off	15,730,439	1,271,087
Debt at the accession of Queen Anne, in 1702	16,394,702	1,310,942
Debt contracted during Queen Anne's reign	37,750,661	2,040,416
Debt at the accession of George I., in 1714	54,145,363	3,351,358
Debt paid off during the reign of George I., above debt contracted	2,053,125	1,133,807
Debt at the accession of George II., in 1727	52,092,238	2,217,551
Debt contracted from the accession of George II. till the peace of Paris in 1763, three years after the accession of George III	86,773,192	2,634,500
Debt in 1763	138,865,430	4,852,051
Paid during peace, from 1763 to 1775	10,281,795	380,480
Debt at the commencement of the American war, in 1775	128,583,635	4,471,571
Debt contracted during the American war	121,267,993	4,980,201
Debt at the conclusion of the American war, in 1784	249,851,628	9,451,772
Paid during peace, from 1784 to 1793	10,501,380	243,277

Historical Periods	Capital of Debt.	Interest and Management.
	£	£
Debt at the commencement of the French war, in 1793	239,350,148	9,208,495
Debt contracted during the French war........................	601,500,343	22,829,696
Total funded and unfunded debt on the 1st of February, 1817, when the English and Irish Exchequers were consolidated	840,850,491	32,038,191
Debt cancelled from the 1st of February, 1817, to 5th of January, 1836	53,211,675	2,894,674
Debt, and charge thereon 5th of January, 1836...............	787,638,816	29,143,517
Debt, including terminable annuities, and charge thereon 31st of March, 1878.............	777,781,596	28,412,750
	$3,888,907,980	$142,063,750

IX. Banking.

The *Bank of England*, which has long been the principal bank of deposit and circulation in *G. B.*, and indeed in Europe, was founded in 1694. Government being at that time much distressed for want of money, the bank grew out from a loan of £1,200,000 for the public service. The subscribers, besides receiving 8 per cent on the sum advanced as interest, and £4,000 a year as the expense of management, in all £100,000 a year, were incorporated into a society denominated the Governor and Company of the Bank of England. The charter is dated the 27th of July, 1694. It declares, among other things, that "the corporation is prohibited from engaging in any sort of commercial undertaking other than dealing in bills of exchange, and in gold and silver. It is authorized to advance money upon the security of goods or merchandise pledged to it, and to sell by public auction such goods as are not redeemed within a specified time." And in 1697 it was enacted, that the "common capital or principal stock, and also the real fund, of the governor and company, or any profit or produce to be made thereof, or arising thereby, shall be exempted of any rates, taxes, assessments, or impositions whatsoever during the continuance of the bank." The year 1708 is memorable in the history of the bank for the act declaring that during the continuance of the corporation of the Bank of England "it should not be lawful for any body politic, erected or to be erected, other than the said governor and company of the Bank of England, or of any other persons whatsoever, united or to be united in covenants or partnership, exceeding the number of six persons, in that part of *G. B.* called England, to borrow, owe, or take up any sum or sums of money on their bills or notes payable on demand, or in any less time than six months from the borrowing thereof." It will be seen on examination that the proviso did not prohibit the formation of associations for general banking business; it simply forbade the issue of notes by associations of more than six partners; but the issue of notes was regarded as so essential to the business of banking, that it came to be believed that joint-stock banking associations were absolutely prohibited in England, and no such association was founded until after the legislation of 1826, expressly permitting them to be established. The charter of the Bank of England, when first granted, was to continue for eleven years, certain, or till a year's notice after the 1st of August, 1705. The charter was further prolonged in 1697. In 1708, the bank, having advanced £400,000 for the public service, without interest, the exclusive privileges of the corporation were prolonged till 1783. And in consequence of various advances made at different times, the exclusive privileges of the bank were continued by successive renewals till the 5th of April, 1886. The capital of the bank on which dividends are paid has never exactly coincided with, though it has seldom differed very materially from, the permanent advance by the bank to the public. Between 1694 and 1727 it had increased to near £9,000,000. In 1746 it amounted to £10,780,000. From this period it underwent no change till 1782, when it was increased 8 per cent, amounting to £11,642,-400. It continued stationary at this sum down to 1816, when it was raised to £14,553,000 ($72,765,000), which is its actual amount.

In 1826 the law of 1708, limiting to six the number of partners in banking establishments issuing notes, was repealed; and it was enacted, that banks with any number of partners might be established for the issue of notes anywhere beyond sixty-five miles from London, and that banks not issuing notes might be established in London itself with any number of partners. The circulation of notes for less than five pounds in England and Wales was at the same time forbidden. It was intended to extend the same prohibition to Scotland and Ireland, but the opposition to the proposal excited in these countries was too strong to be overcome. Very few joint-stock banks were set on foot for some years after the act permitting their establishment; but the mania for embarking in speculative schemes, which raged with violence during 1835 and part of 1836, extended to joint-stock banks, of which from about 220 to 280 were opened in England and Wales. At the beginning of 1836, when the rage for establishing joint-stock banks was at its height, the exchange was either at par, or slightly in our favor, showing that the currency was already up to its level, and that if any considerable additions were made to it, the exchange would be depressed, and a drain for bullion be experienced. But these circumstances, if ever they occurred to the managers of the joint-stock banks, do not seem to have had, and could not in truth be expected to have, any material influence over their proceedings. Their issues, which amounted on the 26th of December, 1835, to £2,799,551, amounted on the 25th of June, 1836, to £3,588,064, exclusive of the vast mass of additional bills, checks, and other substitutes for money they had put into circulation. The consequences were such as every man of sense might have foreseen. In April, 1836, the exchange became unfavorable, and bullion began to be demanded from the Bank of England. The directors, that they might the better meet the drain, raised the rate of interest in June from 4 to 4½ per cent, and this not being enough sufficiently to lessen the pressure on the bank for discounts, they raised it in August from 4½ to 5 per cent. But during the whole of this period the country banks went on increasing their issues; and the issues of the joint-stock banks rose from £3,588,064 in June, to no less than £4,258,197 on the 31st of December, being an increase of nearly 20 per cent after the exchange was notoriously against the country; and the most serious consequences were apprehended from the continued drain for bullion. In the end, no doubt an efflux of bullion was sure, by rendering money and all sorts of pecuniary accommodation scarce in the metropolis, to affect the country banks as well as the Bank of England; and then the injury to industry, occasioned by the withdrawal of their accustomed accommodations from a great number of individuals, was felt in proportion to the too great liberality with which they had previously been supplied. The shock given to industrial undertakings, by the revulsion in the latter part of 1836 and in 1837, although unaccompanied by any panic, was very severe. All sorts of commercial speculations were for a while completely paralyzed, and there were but few districts in which great numbers of individuals were not thrown out of employment. Owing to the Bank of England having delayed, in 1838 and the earlier part of 1839, to take efficient measures for the reduction of its issues, despite the unmistakable evidence of their being redundant, the bullion in its coffers was reduced in September, 1839, to £2,406,000; and, but for the efficient assistance obtained from the Bank of France, its stoppage could hardly have been averted. This perilous experience having forcibly attracted the public attention to the state of the banking system, Sir Robert Peel was induced to attempt its improvement, and the measures that he introduced and carried through Parliament in 1844 and 1845 have effected most important and beneficial changes. The measures in question consisted of the Act 7 and 8 Vict. c. 32, which refers to the Bank of England and the English country banks; and the Acts 8 and 9 Vict. c. 38, 37, referring to the banks of Scotland and Ireland. These statutes were intended to obviate the chances of over-issue payable on demand, and by making the amount of such notes in circulation vary with the amount of bullion in the possession of the issuers, which object has been perfectly attained. The statutes have as completely failed to attain a second object contemplated by their author, — that of preventing great and rapid fluctuations in the rate of discount; and the truth is now recognized, that the power of over-issuing notes is one of many causes which may conduce to variations in the rate of discount, and by no means the most efficient of them. The Act of 1844 effected a complete separation between the issuing and banking departments of that establishment, giving the directors full liberty to manage the latter at discretion, while they should have no power whatever over the other.

The notes of the Bank of England in circulation for some years previously to 1844 rarely amounted to twenty, or sunk so low as sixteen millions. And such being the case, Sir Robert Peel was justified in assuming that the circulation of the bank could not, in any ordinary condition of society, or under any merely commercial vicissitudes, be reduced below fourteen millions. And the Act of 1844 allowed the bank to issue this amount upon securities, of which the £11,015,100 lent by the bank to the public was the most important item. Inasmuch, however, as the issues of the provincial banks were at the same time limited in their amount, and confined to certain existing banks, it was further provided, in the event of any of these banks ceasing to issue notes, that the Bank of England might be empowered, by order in council, to issue, upon securities, two thirds, and no more, of the notes which such banks had

been authorized to issue. Under this condition, the total secured issue of the bank has (1875) been increased from £14,000,000 to £15,000,000. *But for every other note which the issue department may at any time issue over and above the maximum amount* (£15,000,000) *issued on securities, an equal amount of coin or bullion must be paid into its coffers.* And hence, under this system, the notes of the Bank of England are rendered really and truly equivalent to gold, while their immediate conversion into that metal no longer depends, as it previously did, on the good faith, the skill, or the prudence of the directors. It is alleged that the new system is injurious by shackling the bank in the use of its credit, and the answer is, that it does this in order to prevent the greater injury of over-issues of paper. The Act prevents the bank from issuing substitutes for money which do not represent money. It does not absorb or lock up a single sixpence worth of capital, nor does it interfere in any manner of way with its employment. The gold in the issue department of the bank was not purchased by the bank, and does not belong to it. The bank is its keeper, but not its owner. It belongs to the public, or to the holders of bank-notes, who deposited it in the bank in exchange for notes, with and under the express stipulation, that on paying the latter into the bank they should receive back their gold. Any interference with these deposits would be an interference with property held in pledge for others, that is, it would be an act precisely of the same kind with that which exposes private bailees to penal servitude. But though the bank directors may not lay violent hands on the property of the public, the bank, it is obvious, has at this moment the same absolute command over its entire capital and credit, that it would have were the Act of 1844 non-existent. Apart from the practice of issuing transferable notes, the bank is free from all restraint, and is in precisely the same situation as other banking or mercantile establishments. Its directors may lend or not lend as they please, and may lay down such conditions as they please in regard to the interest and the terms of loans and discounts. In short, they may do whatever they like with their own; but further they are not permitted to go. They may not substitute shadows for realities. They cannot, whether to assist others or to relieve themselves from embarrassment, issue a single note except upon a deposit of bullion.

So far we have dealt with the legislation of 1844 in its bearing on the Bank of England. The desire of Sir Robert Peel reached beyond this, but he was unable to complete his policy. He rightly held that experience had shown that the balance of advantages lay on the side of the suppression of all note issues except that of the Bank of England, as reformed by him, or of some similar supplementary establishments regulated in the same manner. But it was obviously impossible to prohibit, without compensation, the future exercise by country bankers of the rights they had legitimately acquired; and as it was not easy to buy up the existing privileges of the private and joint-stock banks, Sir Robert Peel allowed them to remain under conditions prohibiting their extension, and he apparently hoped that country issues would gradually disappear before the rivalry of Bank of England notes. The Act of 1844, accordingly, enacted that no new bank for the issue of notes should be established in any part of the United Kingdom; and that the *maximum* issue of notes by the existing country banks of England should in future be limited to the average amount which they had respectively in circulation during the twelve weeks preceding April 27, 1844. It was also ordered that the names of the partners in joint-stock and other banks should be periodically published. A provision was also enacted under which an issuing bank could resign its privilege by composition with the Bank of England. The existing law was maintained preventing the issue of any notes other than the Bank of England in London, and the establishment, within sixty-five miles of London, of any branch of an English joint-stock bank having the privilege of issue.

The convertibility of the Bank of England notes has been perfectly maintained since 1844, and the management of English banks, whether private or joint-stock, has been sound and judicious, the cases of failure among them being few and contrasting strongly with the recurrent epidemics of insolvency of earlier experience.

We have already said that Sir Robert Peel contemplated an ultimate extinction of all note issues save that of the Bank of England; and he probably expected that the substitution of Bank of England notes for all others would not be long delayed. The progress actually achieved towards this end has been very slow. Out of 204 private banks in England and Wales left by the Act of 1844, with total privileged issues of £5,153,407, no more than 85 have ceased to issue; and the amount they issued which is now withdrawn was £1,285,041. Of joint-stock banks 18 have ceased to issue £842,453, out of 72 having privileged issues of £3,495,446. Only one Scotch bank has ceased to issue notes since the Scotch Act of 1845, and no alteration whatever has taken place in the fixed issues of the Irish banks.

The Bank of England transacts the whole business of government. "She acts not only," says Adam Smith, "as an ordinary bank, but as a great engine of state. She receives and pays the greater part of the annuities which are due to the creditors of the public; she circulates Exchequer bills; and she advances to the government the annual amount of the land and malt taxes, which are frequently not paid till some years thereafter." Previous to 1786 the bank received an allowance for paying the dividends, superintending the transfer of the stock, etc., of the national debt, at the rate of £562 10s. a million on its account; but, after several successive modifications, a fresh arrangement was made in 1861 between the government and the bank, to endure for 25 years. Under this agreement the bank receives £300 per million on £600,000,000, and £150 per million on the amount of debt above that sum; but from these allowances are deducted £60,000 for exemption from stamp duties, and the whole allowance out of profit of issue, making together nearly £200,000. It should be observed that the responsibility and expense incurred by the bank, in managing the public debt, are very great. The temptation to the commission of fraud, in transferring stock from one individual to another, and in the payment of the dividends, is well known; and notwithstanding the skilfully devised system of checks adopted by the bank for preventing this, it has frequently sustained very great losses by forgery and otherwise. Formerly the business transacted at the bank was so much encumbered with forms and conditions, that the generality of merchants and ordinary people rarely thought of employing it to keep their money or make their payments. But in this respect an entire change has been effected. Checks, the minimum amount of which was formerly £10, may now be drawn of any amount, great or small; and all sorts of banking business is conducted with facility and despatch, and, it may be added, with perfect security.

The *Bank of Scotland* was established by Act of the Scotch Parliament in 1695, by the name of the Governor and Company of the Bank of Scotland. Its original capital was £100,000 sterling, distributed in shares of £83 6s. 8d. each. The Act exempted the capital of the bank from all public burdens, and gave it the exclusive privilege of banking in Scotland for twenty-one years. The objects for which the bank was instituted, and its mode of management, were intended to be, and have been, in most respects, similar to those of the Bank of England. The responsibility of the shareholders is limited to the amount of their shares. The capital of the bank was increased to £200,000 in 1774, and was enlarged by subsequent acts of Parliament, the last of which was passed in 1804, to £1,500,000, its present amount. Of this sum £1,000,000 has been paid up. On the union of the two kingdoms in 1707, the Bank of Scotland undertook the recoinage, and effected the exchange of the currency in Scotland. It was also the organ of government in the issue of the new silver coinage in 1817. The Bank of Scotland is the only Scotch bank constituted by Act of Parliament. It began to establish branches in 1696, and issued notes for one pound as early as 1704. The bank also began, at a very early period, to receive deposits on interest, and to grant credit on cash accounts, a minute of the directors with respect to the mode of keeping the latter being dated as far back as 1729. It is, therefore, entitled to the credit of having introduced and set on foot the distinctive principles of the Scotch banking system, which, whatever may be its defects, is perhaps superior to most other systems hitherto established. Generally speaking, the Bank of Scotland has been cautiously and skilfully conducted; and there can be no doubt that it has been productive, both directly and as an example to other banking establishments, of much public utility and advantage.

The *Royal Bank of Scotland* was established in 1727. Its original capital of £151,000 has been increased to £2,000,000. — The *British Linen Company* was incorporated in 1746, for the purpose, as its name implies, of undertaking the manufacture of linen. But the views in which it originated were speedily abandoned, and it became a banking company only. Its capital amounts to £1,000,000. — None of the other banking companies established in Scotland are chartered associations with limited responsibility, the partners being liable, to the whole extent of their fortunes, for the debts of the firms. The number of partners is in every case considerable. The affairs of the banks are uniformly conducted by a board of directors, annually chosen by the shareholders.

The *Bank of Ireland* was organized in 1783, with similar privileges to those of the Bank of England in respect to the restriction of more than six partners in a bank, and the injury that Ireland has sustained from the repeated failure of banks may be mainly attributed to this defective regulation. Had the trade of banking been left as free in Ireland as in Scotland, the want of paper money that would have arisen with the progress of trade would in all probability have been supplied by joint-stock companies, supported with large capitals and governed by wise and effectual rules.

In 1797, when the Bank of England suspended its payments, the same privilege was extended to Ireland; and after this period the issues of the Bank of Ireland were rapidly increased. In 1797 the amount of the notes of the Bank of Ireland in circulation was £621,917; in 1810, £2,266,471; and in 1814, £2,986,999. In 1821, in consequence of eleven banks having failed nearly at the same time, in the preceding year, in the South of Ireland, government succeeded in making an arrangement with the Bank of Ireland, by which joint-stock companies were allowed to be established at a distance of fifty miles (Irish) from Dublin, and the bank was permitted to increase its capital from 2½ to 3 millions sterling. The bank has of late established branches

in all the principal towns of Ireland. The three principal banks of Ireland are: the *National Bank of Ireland*, which has a head office, with several branches, in London; the *Provincial Bank of Ireland*, which has also set up a head office in London, without, however, competing for general business in the metropolis; and the *Munster Bank*, which has its head office in Cork, and has established upwards of 40 branches.

The following table gives the financial condition of all the joint-stock banks of England, Scotland, and Ireland, on January 1, 1879:—

NAME OF BANK.	When established.	Capital authorized.	Shares of	Paid-up capital	Paid per share	Reserve.	Dividend for the complete year 1878.	Price, Jan. 1, 1879.
		£	£	£	£	£	Per ct.	
Aberdeen Town and County Banking Company....	1825	720,000	20	252,020	7	126,000	13¾	8½
Agra Bank (*Limited*)	1867	1,000,000	10	999,680	10	150,060	6	10½
Alliance Bank (*Limited*), 1862	1871	2,000,000	25	800,000	10	185,000	6	10
Anglo-Egyptian Banking Company (*Limited*)......	1864	1,600,000	20	1,600,000	20	......	7½	21
Anglo-Californian Bank (*Limited*)........	1873	600,000	20	300,300	10	38,000	9	10¼
Australian Joint-Stock Bank........	1853	1,000,000	10	500,000	8	135,000	12½	...
Bank of Australasia	1835	1,200,000	20	1,200,000	40	242,123	12½	73
Bank of British Columbia	1862	500,000	20	346,000	20 & 10	38,000	7	19½
Bank of British North America........	1836	1,000,000	50	1,000,000	50	206,871	5	49
Bank of Egypt	1856	250,000	25	250,000	25	45,000	5½	25
Bank of Ireland........	1783	3,000,000	100	3,000,000	100	1,034,000	12	314
Bank of New South Wales........	1817	1,000,000	20	1,000,000	20	450,000	17½	52
Bank of Scotland........	1695	4,500,000	100	1,250,000	100	767,907	14	285
Bank of Victoria (Australia)........	1852	1,000,000	50	500,000	25	230,000	12	46
Bank of South Australia	1841	2,000,000	25	625,000	25	200,000	12	41
Bank of New Zealand	1861	1,000,000	10	725,000	10	325,000	15	24
Bank of Montreal	1818	2,465,753	40	2,465,424	41.25	1,169,214	12	...
Bank of Constantinople	1872	1,000,000	10	600,000	6	....	18	6
Belfast Banking Company........	1827	1,000,000	100	250,000	25	200,000	20	109
British Linen Company Bank........	1746	1,000,000	100	1,000,000	100	431,940	14	265
Caledonian Banking Company........	1838	600,000	10	150,000	2½	80,847	14	1¾
Capital and Counties Bank.	1834	1,750,000	50	350,000	10	210,000	20	..
Central Bank of London (*Limited*)	1863	1,000,000	10	100,000	5	20,000	8	8½
Chartered Bank of India, etc.	1853	800,000	20	800,000	20	150,000	6	17
Chartered Merchants' Bank of India	1854	1,500,000	25	750,000	25	151,560	8	21
City Bank.	1855	1,200,000	20	600,000	10	205,000	10	13½
Clydesdale Banking Company........	1838	1,000,000	Stock.	1,000,000	Stock.	500,000	14	186
Colonial Bank.	1836	2,000,000	100	600,000	30	90,000	14	59
Colonial Bank of Australasia	1856	1,000,000	10	437,500	7	55,000	9	...
Commercial Bank of Scotland	1810	3,000,000	100	1,000,000	100	421,332	15	260
Consolidated Bank (*Limited*)	1863	2,000,000	10	800,000	4	155,000	10	6¼
English Bank of Rio de Janeiro (*Limited*).	1863	1,000,000	20	500,000	10	72,500	8	10¼
English, Scottish, and Australian Chartered Bank	1852	1,000,000	20	720,000	20	105,000	8	21½
Hibernian Joint-Stock Bank........	1825	2,000,000	100	500,000	25	245,000	11½	56
Hong-Kong and Shanghai	1865	1,000,000	25	1,000,000	25	240,000	7⅛	36
Imperial Bank (*Limited*)	1862	3,000,000	50	675,000	15	100,000	6	16½
Imperial Ottoman Bank	1863	10,000,000	20	5,000,000	10	....	..	8¾
London and River Plate (*Limited*)	1862	1,500,000	100	600,000	50	111,500	6½	39
London and South Western Bank (*Limited*)........	1862	1,000,000	100	200,000	20	30,000	8	25½
London and Westminster Bank	1834	10.000,000	100	2,000,000	20	914,813	14	55
London and County Bank	1836	3,750,000	50	1,500,000	20	750,000	17	57
London Joint-Stock Bank	1836	4,000,000	50	1,200,000	15	569,113	16½	41
London Chartered Bank of Australia	1852	1,000,000	20	1,000,000	20	120,000	10	25
London and San Francisco Bank (*Limited*)	1865	1,000,000	10	600,000	10	96,000	8	12¼
London and Provincial Bank (*Limited*)	1864	1,000,000	10	200,000	5	103,200	12½	11¼
Merchants Banking Company of London (*Limited*)	1863	2,000,000	100	375,000	25	100,000	10	31
Metropolitan Bank (*Limited*).	1867	400,000	10	192,000	10	....	8	7¼
Midland Banking Company (*Limited*)........	1863	1,500,000	100	300,000	20	50,000	8	25½
Munster Bank (*Limited*).	1864	1,000,000	10	350,000	3½	150,000	12	8½
National Bank of Australasia........	1858	1,000,000	5	800,000	4	287,500	12½	8½
National Bank	1835	2,500,000	50	1,500,000	30	140,000	12	70
National Bank of India (*Limited*)	1863	2,000,000	25	465,250	12½	20,000	6	.
National Bank of Scotland..	1825	5,000,000	100	1,000,000	100	500,000	15	270
National Provincial Bank of England..	1833	3,112,500	50 & 20	1,687,500	21, 12	900,000	21	80
North Eastern Banking Company (*Limited*)	1872	1,020,000	20	236,100	6	80,673	4⅛	4¼
North of Scotland Banking Company..	1836	1,972,500	20	394,500	4	203,441	12½	10
North Western Banking Company (*Limited*).......	1864	2,000,000	20	405,000	7½	120,000	8	10½
Northern Banking Company..	1825	1,000,000	100	300,000	30	127,500	15	86
New London and Brazilian (*Limited*)	1871	1,000,000	20	450,000	10	131,000	6	9
Oriental Bank Corporation........	1851	1,500,000	25	1,500,000	25	325,000	10	32
Provincial Bank of Ireland........	1825	2,000,000	100, 10	540,000	25	202,968	15	69½
Royal Bank of Ireland.	1836	1,500,000	50	300,000	10	200,000	15	31
Royal Bank of Scotland	1727	2,000,000	100	2,000,000	100	700,000	9½	200
Standard Bank of British South Africa (*Limited*).	1862	4,000,000	100	850,000	25	270,000	12	37
Ulster Banking Company	1836	2,000,000	10	300,000	2½	300,000	20	10½
Union Bank of Australia........	1837	1,500,000	25	1,500,000	25	780,000	16	55
Union Bank of London.	1839	4,500,000	50	1,395,000	15½	431,123	15	36
Union Bank of Scotland........	1830	1,000,000	100	1,000,000	100	330,000	13	182

X. Colonies.

The colonies and dependencies of *G. B.* embrace about one seventh of the land surface of the globe, and nearly a fourth of its population. The following table gives a complete list of these colonies and dependencies, most of which are separately noticed in this work: —

Countries.	Area sq. miles.	Population.	Year of census.
I. Europe: —			
Heligoland	0.21	1,913	1871
Gibraltar	1.93	25,143	1873
Malta	142.73	147,306	1876
Total Europe	144.87	174,362	....
II. Asia: —			
Cyprus	1,308	150,000	....
British India	908,971	191,168,400	1872
Ceylon	24,702	2,556,777	1876
Straits Settlements	1,445	308,097	1871
Hong-Kong	32	139,144	1876
Labuan	30	4,898	1871
Nicobar Islands	725	5,000	1857
Andaman Islands	2,551	13,500	1874
Laccadive Islands	744	6,800	....
Curia-Muria Islands	21	......	....
Aden	6	22,707	1872
Perim	7	211	1871
Mosha	......	....	....
Kamaran	64	500	....
Keeling Islands	8	400	1853
Total Asia	940,614	194,376,434	....
III. Africa: —			
Cape Colony, inclusive of British Caffraria	199,950	720,984	1875
Basuto Land	8,450	127,701	1875
West Griqua Land	16,632	45,277	1875
Transkei Territory	12,452	254,500	1875
Natal	18,750	326,950	1877
Transvaal	114,340	40,000	....
Natives in Transvaal	......	275,000	....
Namaqua Land	99,927	16,850	....
Damara Land	99,965	121,150	....
Gambia	69	14,190	1871
Sierra Leone	468	38,936	....
Gold Coast	16,626	520,070	....
Lagos	73	60,221	1871
St. Helena	47	6,241	1871
Ascension	34	27	....
Tristan da Cunha	45	85	....
Mauritius	739	316,042	1871
Dependencies of Mauritius	286.3	13,391	....
New Amsterdam	25.5	......	....
St. Paul	2.8	......	....
Total Africa	588,882	2,911,495	....
IV. Australasia: —			
Queensland	668,259	187,100	1878
New South Wales	308,560	799,139	1876
Norfolk Island	16.8	481	1871
Victoria	88,451	840,300	1876
South Australia	380,602	225,677	1876
Northern Territory	523,531	743	1876
Western Australia	975,824	27,321	1876
Natives in Australia	....	55,000	....
Tasmania	26,215	105,484	1876
New Zealand	104,272	414,171	1878
Maoris in New Zealand	....	45,470	1874
Chatham Islands	628	172	1878
Auckland Islands	196.7	......	....
Lord Howe's Island	3.2	40	1876
Feejee Islands	8,033.8	1,569	1876
Natives of the Feejee Islands	......	118,000	1876
Fanning Island	21	150	1858
Starbuck Island	......	......	....
Caroline Island	25.5	......	....
Malden Island	3.2	79	1876
Total Australasia	3,048,671	2,651,500	....
V. America: —			
Dominion of Canada	3,372,290	3,686,596	1876
Newfoundland	40,200	161,374	1874
Bermudas	40.8	13,418	1876
British Honduras	7,562	24,710	1871
Bahama Islands	5,390	39,162	1871
Turk's Islands	9.7	2,845	1871
Caicos Islands	213	1,878	1871
Jamaica	4,193	506,154	1871
Cayman Islands	225	2,400	1871
Leeward Islands	650.6	118,013	1871
Windward Islands	830	290,108	1871
Trinidad	1,754	109,638	1871
British Guiana	85,425	218,909	1877
Indians and garrison in Guiana	......	21,600	....
Falkland Islands	6,500	1,114	1876
States Island	(?)	......	....
Total America	3,525,283	5,197,919	....
Total British colonies and possessions	8,103,594	205,313,710	....

XI. Principal Seaports.

Aberdeen, the chief seaport in the N. of Scotland, and the fifth Scottish town in population, industry, and wealth. It lies in lat., 57° 9′ N., lon. 2° 6′ W., on the German Ocean, near the mouth of the River Dee, and is 542 m. N of London, and 111 m. N. of Edinburgh, by rail A defective harbor, and a shallow sand and gravel bar at its entrance, long retarded the trade of A., but they have been greatly deepened, and a new breakwater against S. and S. E. storms has been recently built. Aberdeen Bay affords safe anchorage with off-shore winds, but not with those of the N. E. On the Girdleness, the S. point of the bay, in lat. 57° 8′ N., lon. 2° 3′ W., there is a lighthouse with two fixed lights, one vertically below the other, and respectively 115 and 185 feet above mean tide. Aberdeen has extensive manufactures of woollens, linen, cotton, chemical works, iron foundries, etc. This port has been long famed for ship-building, especially for its fast clippers. About 250 vessels, with an aggregate of 110,000 tons, belong to the port. They trade with British ports, the Baltic and Mediterranean ports, and many more distant regions. In 1878, 462,616 tons of shipping arrived at the port. The export trade, exclusive of coasting, is insignificant. Pop. 88,125.

Barrow-in-Furness, a borough and port in the hundred of Lonsdale, Northwest Lancashire, England, on the Irish Sea, opposite the island of Walney, at the extreme point of the peninsula of Furness, which lies between Morecombe Bay and the estuary of the Duddon. It is a thriving and flourishing town, which, from 325 inhabitants in 1847, has risen to 40,000 in 1880. In the vicinity are veins of pure hematite iron, which are extensively worked. The principal industry is the manufacture of iron and jute, and iron-ship building. A branch of the Walney Channel is now converted into docks, which serve as a harbor, and the beach as a quay. In 1878, 1,689 vessels entered the port, with a tonnage of 374,600 tons.

Belfast, the chief manufacturing and commercial town of Ireland, and the capital of Ulster. It is situated in lat. 54° 36′ 8.5″ N., lon. 5° 55′ 53.7″ W., at the mouth of the Lagan, which flows into Belfast Lough (Carrickfergus Bay), and is built on an alluvial deposit and land reclaimed from the sea; the greater portion of which is not more than six feet above high-water mark. The outer harbor is one of the safest in Ireland, and ships of large draught can now be brought to the quays, which extend for about a mile on both sides of the river. There are also seven extensive docks and tidal basins, supplied with the necessary conveniences for the shipping. In 1878, 15,877 vessels, whose aggregate tonnage was 1,504,625, entered the port. The exports from Belfast being largely conveyed by steamer to London, Liverpool, and Glasgow, and thence transshipped to their destination, do not appear in the Board of Trade returns, but it may be safely estimated that the gross value of the exports exceeds $100,000,000 annually. The most extensive manufactures of Belfast are those of flax. Pop. 200,000.

Berwick-upon-Tweed, a seaport town of Scotland, at the mouth of the Tweed, in lat. 55° 46′ N., lon. 1° 59′ W., 300 m. N. by W. of London, and 47 E. S. E. from Edinburgh. The depth of water at the bar is 17 feet at ordinary tides, 22 feet at spring tides, but the channel is narrow. Berwick is famous for its salmon fisheries. Pop. 8,721.

Bridgewater, a seaport town of Somersetshire, on both sides of the river Parret, 29 m. S. S. W. of Bristol. The river, which is subject to a bore often two fathoms deep at the

mouth, is navigable for vessels of 700 tons up to the town. Pop. 10,259.

Bristol, a free port town in the W. of England, situated in lon. 2° 35′ 28″ W., lat. 51° 27′ 6″ N., 118 m. from London by rail, and 8 m. inland from Bristol Channel, with which the port communicates by the Avon. The creation of Bristol a free port in 1848 has resulted in great increase of trade. The tonnage of foreign vessels with cargoes entering the town in 1878 was 475,663. Bristol stands fourth of all the seaport English towns in the amount of customs revenue received. It was the first English port that established regular steam communication with the U. States, the first voyage having been made by the "Great Western" in 1838. Its most important manufactures are those of shoes and cotton. Pop. 202,950.

Cardiff, a seaport town of England, in S. Wales, county Glamorgan, on the Bristol Channel, 25 m. W. of Bristol, and 170 W. of London. It possesses magnificent docks, whence coal and iron are yearly exported to the quantity of 1,500,000 tons. It is almost exclusively a mineral port. Pop. 36,249.

Chatham, a naval arsenal and seaport of England, county Kent, on the Medway, 28 m. E. S. E. of London. The dockyard, including the arsenal, is about 1 m in length, and is strongly fortified. Chatham is almost wholly dependent on the great military and naval establishments of the surrounding neighborhood.

Chester, a city and seaport of England, capital of Cheshire, on the Dee, 17 m. S. by E. of Liverpool. This port is almost entirely engaged in the coasting trade. Pop. 35,701.

Colchester, a seaport town of England, county Essex, 50 m. N. E. of London. It is almost entirely engaged in the coasting trade. Pop. 23,337.

Cork, a city and port of Ireland, and a county in itself, 138 m. S. W. of Dublin, in lat. 51° 53′ 39.3″ N., lon. 8° 20′ W. The city proper is built on an island formed by the Lee, 11 m. above the entrance of that river in Cork Harbor. Until lately it ranked as the second city of Ireland, but of late Belfast has far surpassed it in population, wealth, and commerce. Its trade, however, is extensive, the exports consisting of butter, corn, flour, and other Irish produce. The registered tonnage of vessels at the port in 1878 was 35.016. The number and tonnage of vessels entering the port, employed in the coasting trade, reached 2,658 vessels and 678.511 tons; in the British colonial trade, 64 vessels and 27,914 tons; in the foreign trade, 617 vessels, tonnage 157,560. Pop. 78,642. *Cork Harbor* is a fine land-locked basin, formed by the estuary of the Lee, which is navigable to 1½ m. above Cork city. It is large and deep enough to contain the whole British navy, and has an entrance one mile across, within which its breadth varies to 8 m. It contains Spike and Haulbowline Islands, on which are artillery barracks and various ordnance works. Lat. 51° 50′ 4″ N., lon. 8° 19″ W. On its shores are the towns of Cove and Passage, with quays 4 m. in length, and which were erected at a cost of $500,000.

Dover, the principal cinque-port of England, on Dover Strait, 72 m. E. S. E. of London, at the nearest point of England to the continent of Europe, being 21 m. from Cape Grisnez, and 25½ m. N. W. of Calais. Its principal feature is its castle, perched on a cliff about 320 feet above sea-level, which, with its immense defences, renders it one of the strongest, as it is certainly one of the most important, fortresses in the British Islands. Pop. 28,270.

Dublin, the metropolis of Ireland, in prov. Leinster, and a county in itself. It stands on both sides of the river Liffey for the space of 2 m., before it falls into the splendid Bay of Dublin. It is situated in lat. 53° 20′ 38″ N., lon. 6° 17′ 13″ W., 138 m. W. from Liverpool, and 60 m. W. of Holyhead. Dublin has little of the bustle which should mark so large a city. There is, too, a spirit of foolish pride which seeks to disown trade; and the tendency to be poor and genteel in the civil service, at the bar, in the army, in professional life, rather than prosperous in business, is one of the most unfortunate and strongly marked characteristics of Dublin. That this is attributable to the lingering yet potent influence of an unhappy past is held by some; while others attribute the weakness to the viceregal office and the effects of a sham court. Dublin produces nothing for exportation save whiskey and porter. The whiskey-trade has been greatly extended. Of the 22 distillers and 43 rectifiers in Ireland, the principal are in Dublin; the three houses of Jameson and Roe and Power may be specially mentioned. The porter-trade is also very large. The exports in 1875 were 361,465 hogsheads. The docks in the river have been improved considerably within the last quarter of a century. The river has been deepened, wharves have been built, new docks have been constructed; and a basin now almost completed, at a cost of $1,380,000, will add greatly to the accommodation. The two great lines of railway, the Midland and the Great Southern, have extended their ways to the river's edge, so that traffic is much easier and swifter between the provinces and the boats for England than in former times. In 1878, 621 British and foreign vessels entered, and 465 cleared the port of Dublin; while 7,548 vessels engaged in the coasting trade entered. The total value of all exported articles from Dublin in 1878 was $255.560. Pop. 314,666.

Dundee, a seaport town on the E coast of Scotland, in the county of Forfar, on the N. bank of the Firth of Tay, 12 m. from the confluence of that estuary with the German Ocean. It is the third town in Scotland as regards population, and the second in commercial importance. Its lat. is 56° 27′ N., its lon. 2° 58′ W.; it is distant from Edinburgh 42 m. N. N. E., from Perth 22 m. E. It extends nearly 3 m. along the shores of the Tay, and varies in breadth from half a mile to a mile; and the ground gradually rises towards the hill of Balgay and Dundee Law, the summit of the latter being 535 feet above the sea-level. Its general appearance is pleasing and picturesque, and the surrounding scenery very beautiful. Dundee is the chief seat of the linen manufacture in Britain, and from a very early time appears to have had a special reputation in this branch of industry. Side by side with the extension of the linen-trade has been that of jute spinning and weaving. Large cargoes of this material are imported into Dundee direct from India, and it is manipulated on an enormous scale. In fact, the manufacture of flax, hemp, and jute fabrics constitutes the staple trade of the town, and supports, directly or indirectly, the great bulk of the inhabitants. There are upwards of 70 steam spinning-mills and power-loom factories, employing above 50,000 persons. Some of these buildings are of great size and considerable architectural elegance, those of Messrs. Baxter, Messrs. Cox, and Messrs. Gilroy being especially conspicuous. These three afford employment to above 12,000 hands. The principal textile productions are osnaburgs, dowlas, canvas, sheetings, bagging, jute carpeting, etc.; and the total value of these fabrics annually produced has been estimated at upwards of $35,000,000. Among the other industries of Dundee may be mentioned ship-building, engineering, tanning, and leather manufactures (including shoemaking by machinery), all of which are conducted on a large scale. There are also considerable foundries, breweries, corn and flour mills, and confectionery and fruit-preserving works, — Messrs. Keiller & Son's "Dundee marmalade" having a most extensive reputation. The prosperity of Dundee is in a large measure due to its commodious harbor and its magnificent docks. The harbor works extend about 2 miles along the river-side, and the docks, five in number, cover an area of 35 acres. Although they cannot compare in extent with those of London or Liverpool, they are probably unsurpassed in *G. B.* for stability and convenience. There were built in Dundee, in 1878, 29 vessels, with a tonnage of 17,418, and at the beginning of 1880 the shipping belonging to the port consisted of 216 vessels, tonnage 87,781. Pop. 145,000.

Falmouth, on the S. W. coast of England, in county Cornwall, on the S. side of Falmouth Harbor, 15 m. N. N. E. of Lizard Point, and 267 m. W. S. W. of London. It is here noticed in consequence of the excellence of its harbor, and its proximity to Land's End. For about 150 years it was the port from which the mail packets for the Mediterranean, Spain, the West Indies, and South America were despatched; and though these steamers now start from other ports, it maintains steam communication with London, Liverpool, Dublin, Penzance, Plymouth, and Southampton. The harbor is one of the best refuges for shipping in England. Its entrance between St. Anthony's Head on the E. and Pendennis Castle on the W. is about a mile in width, and it thence stretches inland about 5½ m. It has depth of water and excellent anchorage for the largest ships, and vessels of considerable burden can discharge their cargoes at the quay. In 1876 the number that entered the port was 803, with a tonnage of 118,617; the number that cleared was 384, tonnage 26,522. The total value of imports was $1,202,370, and of exports $26,305. Pop. 5,294.

Folkestone, or *Folkstone*, a fortified seaport-town of England, county Kent, in hundred of same name, 62 m. S. E. by E. of London, and 7 W. by S. of Dover. It possesses a spacious harbor and noble pier (erected at a cost of $250,000), whence the tidal steamers sail twice a day to Boulogne on the French coast. Pop. 10,641.

Galway, a seaport town of Ireland, at the N. E. extremity of a bay of same name, 113 m. W. of Dublin. The harbor is safe and commodious, having been much improved of late years. It was used for a time as a station for the large mail-steamers which a few years ago ran from Galway to New York. Its foreign trade is unimportant. Pop. 23,937.

Glasgow, a great commercial and manufacturing city of Lanarkshire, Scotland, situated on the River Clyde, in lat. 55° 51′ 32″ N., lon. 4° 17′ 54″ W., 42 m. E. by S. of Edinburgh. The *Clyde* is one of the principal rivers in Scotland, and has its rise among the mountains that separate the counties of Dumfries and Lanark. The length of this stream, from its source to its junction with the Western sea, is about 100 m. Along its whole course it is beautified by magnificent natural scenery and embellishments of art. Its banks are crowded with the abodes of industry and a thriving population. The site of Glasgow occupies both sides of the river, and though at a distance of above 30 m. from the influx into the sea, the tide, which flows a considerable way above the town, gives it a command of trade and means of ready conveyance for commercial purposes to every quarter of the world. As a guide to mariners, it may be mentioned that vessels of 19 feet draught of water can arrive at the harbor of Glasgow, and that vessels drawing 17 feet are considered regular traders. Vessels drawing 15 to 16 feet may always arrive and depart without touching the bottom. At the entrance to the river vessels are placed

under the charge of pilots, who are well acquainted with the channel, which is well marked with beacons and buoys. It may be considered that the river is deepening at the rate of one foot in every five years. A ship on reaching the mouth of the river had best commence ascending at half-tide. There are no particular usages connected with the harbor of Glasgow beyond those adopted on most other rivers and harbors. Lights are permitted in the harbor from 6 A. M. to 10 P. M. — Glasgow may be said to be *cosmopolitan* in her commerce and manufactures, uniting within herself the businesses and trades of almost every other town and city in the United Kingdom. It hence follows that while one branch of manufacture or trade may be dull, another may be prosperous, and accordingly Glasgow does not feel any of those depressions which so frequently occur in places which have only one or two branches of manufacture or commerce. The great industrial occupations of Glasgow are its cotton spinning and weaving; its collieries and iron manufactures; its iron-ship building and machine making, and its chemical manufactures. Pop. 555,933.

Gloucester, a fine city, capital of county of same name, on the left the bank of the Severn, 36 m. N. N. E. of Bristol. It has spacious docks, and communicates with the open port of the Severn by means of a ship-canal 17 m. in length. Pop. 18,486.

Greenock, a manufacturing town and seaport of Renfrewshire, Scotland, on the S. bank of the Frith of Clyde, 22 m. below Glasgow, in lat. 55° 57′ 3″ N., lon. 4° 45′ 30″ W. In front of the town there is a fine and splendid bay, along the shore of which the town stretches for about 3 m. Greenock is largely engaged in iron-ship building, and carries on an extensive foreign trade. Pop. 57,146.

Hull, one of the principal commercial towns and seaports of England, in Yorkshire, 150 m. N. of the London, at the confluence of the Hull and Humber Rivers. Vessels of the largest size can come up to the town; while the Hull, Ouse, and Trent, affluents of the Humber, with their tributary streams and canals, afford facilities for trade with a large extent of country. It is also connected by railways with all parts of the kingdom. These advantages have been improved by the activity of the inhabitants, so that Hull ranks as the third port in the kingdom, the value of its exports being inferior only to those from Liverpool and London. Hull has magnificent docks, and the quays around them are spacious. Steamers sail regularly to and from London, Leith, Aberdeen, Newcastle, Yarmouth, Hamburg, Rotterdam, Copenhagen, Antwerp, etc. Hull is the principal entrepôt of the Baltic timber-trade on the E. coast of Britain. The staple imports are timber, deals, grain, and seeds, sheep's wool, tallow, hemp, flax, hides, iron bars, green fruit, bones, madder, bark, turpentine, cattle, sugar, etc. The chief articles of export are cotton stuffs and twist; woollen goods and woollen yarn; iron and hardware; linens and linen yarn; earthenware, etc. The industrial establishments of Hull are chiefly connected with the building and equipment of ships, comprising ship-building yards, rope-walks, and manufactories of canvas, chains, chain cables, and steam machinery. Pop 140,002.

Inverness, a seaport town of Scotland, situated on both sides of the river Ness, at its entrance into the Moray Frith, 115 m. from Edinburgh, in lat 57° 28′ 36″ N., lon. 4° 13′ 30″ W. It is a fine town, with a commodious harbor, and was long considered as the metropolis of the Highlands. Pop. 14,425.

Leith, a seaport town of Scotland, on the Frith of Forth, at the mouth of the river Leith, in lat. 55° 58′ 9″ N., lon. 3° 10′ 5″ W. Leith may be considered the seaport of Edinburgh, from which it is only about 2 m. distant. It has several docks of great magnitude, in which vessels of upwards of 2,000 tons burden, of 320 feet in length, and 58 feet in breadth, can be accommodated. Besides having regular steam communication with Rotterdam, Hamburg, Hull, London, Newcastle, and the North of Scotland, Leith trades largely with the Baltic, Mediterranean, North America, and Australia. The exports are principally coal, iron, spirits, ale, paper, linen, yarn, etc. The chief manufactures of Leith are ropes, sailcloth, locomotive engines and machinery, glass, soap, ale, refined sugar, and oil-seed cakes. Iron and timber ship building is also carried on to a considerable extent. Pop. 38,000.

Liverpool, a seaport of England, and the third town in population of the United Kingdom. It is situated in Lancaster County, on the Mersey, about 4 m. from the Irish Sea, 32 m. W. by S. of Manchester, 202 m. N. N. W. of London by railway; lat. 53° 24′ 48″ N., lon. 3° 0′ 1″ W. It has a length of about 8 miles, and a breadth of about 3½ at its widest points. *L.* stretches along the river, and has docks and basins having an aggregate water-area of nearly 200 acres, and extending for 9 m., erected at a cost of $65,000,000. Among the largest of the docks are the Brunswick, Albert, Waterloo, Prince's, Clarence, Nelson, Victoria, Trafalgar, Collingwood, Wellington, Stanley, Huskisson, Sandon, Salisbury, Canada, etc. The streets are mostly spacious, and airy, and some of them elegant. The older parts of the town have been greatly improved, while the public buildings are formed in a style of elegance and splendor suitable to the taste and opulence of its inhabitants. The trade of Liverpool with all parts of the world is very great. Its commercial intercourse with the U. States is particularly of great magnitude, for the great trade of Liverpool is cotton, the largest quantities of which come from our Southern States It receives, also, from this country considerable quantities of wheat, corn, and flour. An immense emigration takes place yearly from this port. Liverpool has several large fleets of splendid steamers in almost daily communication with New York, Boston, Philadelphia, and Baltimore. In 1878 the total shipping of Liverpool was 12,788,516 tons. There are several eminent ship-builders in Liverpool, but the greater part of the trade is now in repairing and in the building of iron ships. There are five building-yards on the Lancashire side of the river, and three on the other side. Those on the Cheshire side combine graving with building docks, and, although there are several graving-docks on the Liverpool side, they are found to be inadequate to the wants of the port. As might be expected, a large trade is carried on in ships. About 700 ships are sold yearly, of which about a fifth is bought by foreigners. Liverpool is a place of trade rather than of manu-

Fig. 248. — Lizard Point.

factures, and those manufactures which exist are more for the supply of local wants than for general purposes. Pop 527,083.

London [Fr. *Londres*], the metropolis of the British Empire, and the principal shipping-port of *G B*, is the most populous, wealthy, and commercial city of the world. It is situated partly and principally on the N bank of the Thames, in the county of Middlesex, and partly on its S. bank in the county of Surrey, about 45 m above the river's mouth at the Nore, and 15 below the highest tide-way. St. Paul's, the most striking object in the city, is in lat. 51° 30′ 48″ N., lon. 0° 5′ 48″ W. of Greenwich. The site on the N. side is high and dry, but on the S it is so low as to be under the level of the highest tides, though by a well-constructed system of drainage it is kept perfectly free from wet. The air is temperate, and rather dry than moist, and the health of the inhabitants has gradually improved from the earlier part of the last century, when the deaths were annually 1 in 20 of the population, whereas at present they are about 1 in 40. Exclusive of the city of London (properly so called) the metropolis comprises the city and liberties of Westminster, the parliamentary boroughs of Tower Hamlets, Finsbury, Hackney, Marylebone, Southwark, Lambeth, Kensington, Chelsea, and Greenwich, and other contiguous districts, which, though formerly distinct, are now combined to form the huge agglomeration of streets and houses called LONDON. Its length E. from Plumstead in Essex to its W boundary, Hammersmith, in Middlesex, on the N. bank of the Thames, may be estimated at 19 m.; its breadth N. to S, or from Hampstead, in Middlesex, to Camberwell, county Surrey, at 14 m.; while its circumference is not less than 40 m. The united area of the city proper, Westminster city and liberties, etc. (excluding the divisions of Greenwich, Chelsea, and Kensington), is 31,498 acres. The N. and S. portions of London are connected by bridges, viz., those of London Southwark, Blackfriars, Waterloo, Hungerford, Westminster, Vauxhall, Chelsea, Wandsworth, Putney, and Hammersmith, besides several railway bridges. Communication is also maintained subterraneously by the Thames Tunnel and subway. The capital of a great empire, with immense wealth concentrated in it, having easy access, both by land and water, to all parts of the kingdom, and every facility of communication with foreign countries, London has become the greatest commercial city in the world. Its commercial growth and prosperity are especially to be ascribed to its great river-port, the *Thames* This famous stream has its source within the borders of Gloucestershire, a little to the southwest of Cirencester, and becomes navigable at Lechlade, 138 miles above London. It is first affected by the tide about 15 miles above the metropolis, but before reaching this point it is swollen by junction with the Isis, Kennet, Coln, and Wey. The city corporation are the chief conservators of the river, and appoint a navigation committee, who superintend the towing-paths, bridges, water-courses, and whatever relates to the river, as far as a stone a little above Staine's Bridge. Higher up the supervision is divided between the city and a body chiefly composed of the landowners on both sides of the river. The conservation of the river below London is also in some measure under the government of the city corporation, but the Trinity House has concurrent jurisdiction, and no ballast can be raised without its authority. The appointment and control of pilots, the placing and repairs of landmarks and buoys to indicate the channels, and the establishment of floating lights, are also under the superintendence of the Trinity House Close to London Bridge there is water sufficient for vessels of 800 tons burden, and the legislature has placed the shipping of the port, and their moorings, under the direction of the harbor-masters, nominated by the corporation, and approved by the Trinity House. The sinuosities, currents, and shoals in the river, and its varying depth, render the navigation rather intricate. The river pilots, who are a distinct class, conduct vessels to Gravesend, where they are relieved by the sea-pilots. The city proper, forming the E. central division of London, may be termed the centre of commerce of the British Empire. What is legally termed the port of London extends about 7 m. below London Bridge beyond Blackwall; though the *actual* port, consisting of the upper, middle, and lower pools, does not reach beyond Limehouse. Independent of the river accommodation thus afforded for shipping, a series of vast inland docks extends from the Tower to nearly opposite Greenwich. The *West India Docks*, the largest of these (opened in 1802), comprise about 295 acres, a fourth part of which is water-area, the rest being occupied with quays and warehouses of great magnitude. There is, also, here an export and import dock, with ample room for 500 large merchantmen. The *London Docks*, about 1½ m. below London Bridge, cover about 100 acres of ground, of which nearly a third part is water. The vaults beneath the warehouses have cellarage for 65,000 pipes of wine, and one of them has an area of 7 acres. The tobacco warehouses are also very extensive. The *E. and W. India Docks*, smaller than the before-mentioned, and situated further down the river, have a depth of 23 feet, with a water-area of 30 acres The *Commercial Docks*, on the S. side of the river, contain a water-surface of 40 acres; and the *St. Katharine's Docks*, just below the Tower, enclose 24 acres, all being surrounded by extensive warehouses. London, when compared with some of the towns in the N. and W. of England, can scarcely be called a manufacturing place; yet the various articles produced here employ many thousand persons. The silk manufacture, especially, employs a large number of hands. The manufacture of London porter and beer is a much more lucrative business, but a London brewery requires a very large capital. Sugar-refining and clock and watch making also prevail to a considerable extent, the latter chiefly in a district called Clerkenwell. London-built carriages are generally considered the best, as they are undoubtedly the most elegant, in the world. London enjoys a high reputation for the manufacture of numerous smaller articles, such as mathematical, surgical, and musical instruments, jewelry of superior kinds, gold and silver plate, etc. The shops in London are, generally speaking, well managed, and many of them are handsomely fitted up, especially those in Bond Street, Regent Street, and Oxford Street. The wholesale shops or warehouses are chiefly to be found in the city; the retail shops, particularly those on a large scale, being more general in the west or fashionable end of the metropolis. The *Royal Exchange*, colossal in proportions, and occupying a commanding position between the Bank of England and Cornhill, is a spot where great mercantile transactions are daily concluded. The building is quadrangular, and the interior surrounded by arcades. In the centre, which is uncovered and unprotected from the weather, stands a statue of her Majesty, by Lough. The outside of the building, except the grand western entrance, is occupied by small shops; and on the upper floor is Lloyd's, where the business of marine insurance is conducted by underwriters. Merchants and brokers resort much to coffee-houses in the vicinity of the Exchange for the transaction of business. Most of the larger transactions are negotiated by brokers, who in general confine themselves to one branch of trade, with which they are thoroughly acquainted. Near the Royal Exchange and the Bank is the Stock Exchange, where real and fictitious sales are made of property in the public funds, etc. In 1878 the total shipping of the port of London was 14,382,658 tons. Pop. 3,533,484.

Londonderry, a seaport town of Ireland, situated on the Foyle, 120 m. from Dublin, in lat. 54° 59′ 6″ N., lon. 7° 19′ W. It has an extensive trade with the West Indies and the U. States. The harbor is deep, wide, and tolerably secure. Pop. 20,875.

Milford-Haven, a harbor of England, on a basin or deep inlet of the Atlantic, on the coast of South Wales, county Pembroke, forming one of the best ports in the British dominions. Latitude of St. Anne's Heads, the N. W. extremity of the entrance, and on which are three lighthouses, with fixed lights, 51° 41′ N., lon. 0° 10′ 25″ W. Length of haven, about 15 m.; average breadth, 2 m. It is completely land-locked, has deep water, and the whole shipping of the Empire might ride here as safely as in dock, in any weather; while the access is easy, and the egress can be accomplished, by aid of the strong ebb, even in head-winds.

Montrose, a seaport town of Scotland, county of Forfar, at the mouth of the S. Esk, on a projecting tongue of land, between the German Ocean on the E. and the basin of Montrose on the W., 60 m. N. N. E. of Edinburgh; lat. 56° 42′ 5″ N., lon. 2° 28′ W. The harbor is one of the best on the E. coast of Scotland. Pop. 15,000.

Newcastle-upon-Tyne, a town and river port of England, capital of county Northumberland, on the Tyne, 54 m. E. of Carlisle. Its importance is mainly owing to the coal-trade from the mines along both banks of the Tyne. 5,168,330 tons of shipping cleared the port in 1868, mainly consisting of coal. Pop. 120,000.

Plymouth, a seaport town and naval station of England, and, on account of its harbor and docks, one of the most important maritime places of *G. B.*, situated on the E. side of a peninsula between the rivers Plym and Tamar, at the head of Plymouth Sound, lat. 50° 22′ N., lon. 4° 10′ 2″ W. The port of Plymouth is distinguished for its capacity and security; it is capable of containing 2,000 sail, and is one of the best harbors in the world. It consists of three divisions: Sutton-port, adjoining the town; Catwater, formed by an estuary of tho Plym; and the Bay of Hamoaze. At the mouth of these harbors the great bay of Plymouth Sound forms an excellent roadstead, which is now completely secure by the erection of the breakwater across the entrance. This is an isolated mole at the entrance of the Sound 5,100 feet long, and opposing a barrier to the heavy swell of the Atlantic. The Sound is 3 m. long and 4. m. wide, and forms the harbor of Davenport and Plymouth. Altogether there are 9 docks, and the one last formed is said to be the largest in Europe. It is a stopping-place for the steamers between Hamburg and New York. Pop. 70,000.

Portsmouth, a seaport and the principal naval station of England, in the English Channel, on the W. side of the island of Portsea, at the mouth of the bay called Portsmouth Harbor, lat. 50° 47′ N., lon. 1° 6′ W. Portsmouth Harbor excels every other in *G. B.* in depth, capaciousness, and security. At its entrance the harbor is very narrow, but soon expands into a great width. Everywhere the anchorage is good, the depth sufficient for ships of any size, and in extent almost sufficient

to contain the whole English navy. The roadstead of Spithead, between Portsmouth and the Isle of Wight, can contain 1,000 sail with security. The dock-yard, the great naval arsenal of England, extends along the W. shore of the harbor, and includes an area of 293 acres. Ship-building and other manufactures are carried on to a considerable extent. The cod and other fisheries are actively prosecuted, and Portsmouth has considerable foreign and coasting trade. Pop. 120,000.

Preston, a town and riverport of England, county Lancaster, on the Kibble, about 15 m. from its confluence with the Irish Sea, 28 m. N. E. of Liverpool. Its manufactures and exports consist principally of linen and cotton goods. About 140 vessels (tonnage, 8,500) belong to this port. Pop. 90,000.

Scarborough, a seaport town of England, county York, on a bay in the German Ocean, 227 m. N. of Newyork. Its harbor is extensive. safe, and of easy access. Pop. 15,000

Shields (***South***), a seaport town of England, county Durham, at the mouth of the Tyne, 8 m. N.E of Newcastle. Pop. 35,000.

Southampton, a seaport town of England, and a county by itself, in the S. part of the county Hants, occupying a peninsula between the mouths of the Test and Itchin rivers, at the head of Southampton water, 12 m. S. S. W. from Winchester, on the Southwestern Railroad, 72 m. S. W. from London, in lat. 50° 54′ N., lon. 1° 24′ 2″ W. The docks on the E. of the town have an area of 208 acres, and admit steamers of more than 700 tons burden. The West India, Chinese, Australian, and Mediterranean mails have their station here, and the town communicates by steamers with all the ports of South England, the Channel Islands, Ireland, and by railroad with London, and all the centre of England. The port extends from near Portsmouth to Christchurch. Here are some manufactures of silks and carpets, but ship-building and general commerce are the chief sources of wealth. Southampton is a stopping-place for the steamers between Bremen and New York. In 1878, 992,447 tons of shipping entered, and 705,517 cleared, the port. Pop. 55,000.

Stockton-on-Tees, a seaport town of England, county Durham, 11 m. E. N. E. of Darlington, on the left bank of the Tees. Ship-building, chiefly in iron, is carried on to a great extent. The principal article of export is coal. Pop. 32,000

Sunderland, a seaport town of England, county Durham, on the Wear, 13 m. N. E of Durham. Iron-ship building is extensively carried on. Sunderland possesses, next to Newcastle, the largest export trade of coal in the kingdom. Pop. 100,000.

Waterford, a city and seaport of Ireland in province Munster, on the river Suir, which joins the Barrow, and forms a bay called Waterford Harbor, 62 m. N. E of Cork. The harbor is deep and spacious, and has a fixed light on Hook Tower, 139 feet above the sea. Pop. 25,000.

Whitehaven, a seaport town of England, county Cumberland, on the Irish Sea, and near the Solway Frith, 35 m. S. W. of Carlisle. It has extensive iron and brass foundries. Pop. 22,000.

Yarmouth, or *Great Yarmouth*, a seaport town of England, county Norfolk, lat. 52° 36′ 8″ N., lon. 1° 43′ 7″ E. It stands on a peninsula, having the sea on the E., and on the W. the Yare, over which there is a drawbridge, which affords communication with South Town, or Little Yarmouth, and with Gorlestone. Its harbor is perfectly secure, but the coast upon which it is built is the most dangerous in England, and has been often the scene of the most disastrous shipwrecks. It is the principal seat of the English herring-fishery, and has also a considerable coal-trade. Pop 45,000.

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Great Hundred, the long hundred of six score. See HUNDRED.

Great Western, a Marine insurance Co., located in New York City, organized in 1855. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $662,080; net surplus, $94,278.76; risks in force, marine and inland, $4,111,052; premiums, $50,057.23; premiums received since the organization of the Co., $34,788,480; losses paid, $24,142,942.64; cash dividends paid to stockholders, $2,809,498.

Greaves, the sediment of melted tallow made into cakes, and used in England for feeding dogs and cattle.

Grebe, an aquatic bird, *Podiceps cristata*. Its feathers, which are of a rich silver-white color, variously shaded with brown, are retained on the skin, and worn as trimmings, or made into muffs, cuffs, etc. They are very durable.

Greece, a kingdom in the S. W. extremity of Europe, lying between lat. 36° 16′ and 39° 34′ N., and lon. 20° 43′ and 26° 28′ E. In its flourishing period *G.* comprised the entire S. portion of the E. peninsula of Europe, extending N. to lat. 42°, including Thessaly and a part of modern Albania, with the Ionian Islands, Crete, and the islands of the Archipelago. This famous region was originally called *Hellas*, and received the name of Greece from Græcus, Prince of Thessaly. The modern kingdom of *G.*, though much smaller than the ancient country of the same name, comprises the territories of the most celebrated and interesting of the ancient states of *G.*, including all that portion of the continent S. of the gulfs of Arta and Volo, together with the islands of Eubœa, the Cyclades, and the two Sporades. Continental *G.* is naturally divided by the isthmus of Corinth into

two portions: the northern, or Hellas; and the southern, comprising the Peloponnesus, or Morea. The kingdom is divided into 13 Nomos, or Nomarchies, and subdivided into 59 Eparchies. By the return of the last census the area and population of each of the 13 nomarchies were as follows: —

NOMARCHIES.	Area, English square miles.	Population, May, 1870.
NORTHERN GREECE: —		
Attica and Bœotia	2,472	136,804
Phocis and Phthiotis	2,044	108,421
Acarnia and Ætolia	3,013	121,693
PELOPONNESUS: —		
Argolis and Corinth	1,442	127,820
Achaia and Elis	1,901	149,561
Arcadia	2,020	131,740
Messenia	1,221	130,417
Laconia	1,679	105,851
ISLANDS: —		
Eubœa and Sporades	2,216	82,541
Cyclades	923	123,299
Corfu	431	96,940
Zante (Zakynthos)	277	44,557
Cephalonia	302	77,382
Soldiers and Seamen		20,868
Total	19,941	1,457,864

The government is a constitutional monarchy. The present constitution of *G.*, elaborated by a constituent assembly, and adopted Oct. 29, 1864, vests the whole legislative power in a single chamber of representatives, called the Boulé, elected by manhood suffrage for the term of 4 years. The executive is vested in the king and his responsible ministers. The number of public functionaries in *G.* is extraordinarily large. In 1880 there were 18,860 officials in the government service; and, "supposing these 18,860 persons to have families amounting in the average to 5 persons, we find that they maintain 94,300 souls, or one twelfth of the population of *G.*" It is stated that the annual pay of these 18,860 public functionaries amounted at the time to 16,414,207 drachmas, or $2,931,105, being more than one half of the total revenue of *G.* At the liberation of the country in 1830 there were only 9 towns which had partly escaped the total devastation of the rest; the principal of them being Lamia, Vonitza, Nauplia, and Chalcis. All the other towns and villages were in ruins, so that the first necessity of the inhabitants of the new state was to get housed. Since that time 10 new cities have been founded, and 23 old towns, including Athens, Thebes, and Argos, have been rebuilt, besides many villages. *Athens* is the capital of the nomarchy of Attica and Bœotia, as well as of the entire kingdom. It is the residence of the king and court, and the seat of several important institutions of learning, art, and public charity. Its population has slowly increased to 48,107 in 1871. In 1866 was opened the first, and as yet the only, railroad in *G.*, a line of 7 miles, connecting Athens with the port of Piræus. The recommendation made by the Berlin Congress, in 1878, as to the rectification of the Greek frontier, excited great hopes in *G.* The Greek government, in August of that year, addressed a note to the Powers, asking them to use their influence to bring about a settlement, and various propositions having that end in view were made, but nothing definite was arrived at. There exists in *G.* a considerably larger male than female population, the former outnumbering the latter by 50,467 in 1870. The average density of population is but 73 per sq. mile.

Fig. 249. — ATHENS.

The surface of the kingdom is in general mountainous, and the only extensive level tracts are in W. Hellas, and on the northern shores of the Morea; these, with small plains scattered through E. Greece, are the most productive districts. The climate is for the most part healthy, except in the marshy tracts adjoining the coast and lakes; and in the plains the medium temperature of the year is about 60° F. The vegetable products have a great similarity to those of the S. of Italy. Hellas possesses the best corn districts, the richest being perhaps Bœotia, though the wheat of the Morea is that in highest repute; but the supply being insufficient for the consumption, large quantities are imported. The olive and currant-grape are also cultivated extensively. The mineral products are numerous, but only an insignificant quantity of any of them is obtained at present, except copper and salt, which last is

procured in abundance in the lagoons near Missolonghi and elsewhere. Only one sixth of the area of *G.* is under cultivation; the rest, though in greater part good for agricultural purposes, lies waste. The whole superficies of *G.* has been estimated at 45,697,248 stremmas, or 15,233,082 acres, and of this total but 7,435,900 stremmas, or 2,478,633 acres, of land are in cultivation. The ground is chiefly in the hands of a few proprietors; but many of the peasants hold little patches of land of their own, which become smaller from generation to generation, in consequence of the existing law of subdivision, which is the same as that in France. On the whole, agriculture is in a very backward state. According to an enumeration made in 1879, there were only 97,176 horses, 279,445 horned cattle, 45,410 mules, and 97,335 asses in *G.* In contrast to these numbers, there were 2,291.917 sheep and 1,836,-663 goats, the latter, roaming about in a half-wild state, described as the "curse of the country."

General Commerce. *G.* is mainly an agricultural country, and the existing manufactures are few and unimportant. *G.* is indeed naturally adapted for being a commercial rather than a manufacturing state; and though none of the rivers are navigable, and there are few roads, these are rendered less necessary than in most other countries, by the numerous bays and inlets on the coast, along which, as well as between the various islands, there is a perpetual intercourse. To this is in a great measure to be attributed the maritime habits of the Greeks, and the extent of their mercantile navy, which, including small craft, amounted in 1880 to 5,540 vessels, of an aggregate burden of 262,032 tons, navigated by about 20,000 frugal, active, and hardy seamen. Some of the Greek vessels are between 600 and 700 tons register, and a good many from 300 to 400 tons; but the great majority of them are boats of six or seven tons, having a large hatch in mid-ships. It is customary for a ship-owner to bargain with a captain and crew, taking up a certain sum at interest, generally secured on bottomry bond; with this money a cargo is purchased on the ship's account, and the profit is divided between the vessel and the crew, the latter sharing among themselves according to their special agreements. In this way the Greeks carry on extensive speculations in corn whenever bad harvests or other circumstances present openings in the ports of Turkey, Italy, Spain, or France. Besides this, they export the various productions of Turkey, *G.*, Egypt, Persia, and southern Russia, to London, Marseilles, and Trieste. The great advantage which the Greeks have over foreigners in prosecuting this trade is that of having relations and connections in the interior on whom they can rely for the collection of small parcels; and thus they avoid the impositions of agents and the profits of middlemen. The Greek trader despises nothing, and will gather a few bags of rags, or a ton or two of bones and horns, while he is chartering 50 vessels to load with corn and tallow. Then the same vessels supply Turkey, Persia, and *G* with the manufactures of England and Germany. The extensive Greek establishments at Manchester for purchasing, examining, and packing goods, attest the importance of this branch of commerce. They have almost quite superseded the English traders here, chiefly from their thorough knowledge of the countries to be supplied, and their readiness to execute the smallest as well as the largest commissions for the shopkeepers of the East. The Greek trader slips in everywhere, neglects no business, disdains no expedient, and changes his flag as often as he finds it his interest to do so.

The principal places of trade are Syra, Patras, Piræus, Kalamata, and Nauplia. The trade of Patras is chiefly import; Hydra, Spezzia, and Galaxidi come more properly under the denomination of ship-owning ports. The exports consist of raw silk, currants, wool, oil, copper, wine, wax, mastic, and a variety of other articles; the imports, principally of corn, cotton, silk and woollen manufactures, sugar, and coffee. The commerce of *G.* averaged $38,000,000 in the five years 1875–1879, the imports amounting to about $22,000,000, and the exports to $16,000,000. About one fourth of the imports come from, and one third, in value, of the exports go to, Great Britain. The principal other countries with which commercial intercourse is carried on are, in order of importance, France, Turkey, Austria, Italy, Russia, and the U. States. But the value of the imports and exports interchanged with these states is comparatively unimportant. The staple article of export from *G.* to Great Britain is currants, the value of which, in the year 1878, amounted to $4,356.170. At the head of the other articles of export stand olive oil, and lead from the Ionian islands. Of the imports from Great Britain, about one half are manufactured cotton goods.

Commerce with the U. States. The commercial relations of the U. States with *G* are very inconsiderable, — few American vessels ever making the direct voyage to any port in that country. Under the system of commercial equality with privileged nations, secured by treaty of Dec 10, 1837, which is still in force, the U. States flag could successfully compete with the flags of all other nations in the importation of wheat, flour, indian corn, rice, sea-bread, salted meat and salted fish, tobacco, sugar, coffee, and timber; and with that of Great Britain in the importation of cotton goods. There are no data accessible upon which to base any calculation as regards the quantities of these staples, respectively, which might find a market in *G.*, but they are always in demand in the different Greek ports. The commerce of *G.* with the U. States for the 20 years, from 1859 to 1878, was as follows: —

Years.	Imports from the U. States.		Exports to the U. S.	Total imports and exports.
	Domestic.	Foreign.		
	$	$	$	$
1859	13,048	2,367	67,290	82,705
1860	....	......	134,651	134,651
1861	....	......	70,013	70,013
1862	....	......	....	....
1863	....	......	28,012	28,012
1864	....	......	52,605	52,605
1865	....	......	87,751	87.751
1866	....	......	83,765	83,765
1867	....	......	184,783	184,783
1868	....	......	128,925	128,925
1869	....	......	138,431	138.431
1870	....	......	80,001	80,001
1871	33.101	......	298,335	331,436
1872	71,700	......	307,761	379,461
1873	51,379	......	413,604	464.983
1874	32,668	......	484.168	516.836
1875	22,900	......	455,290	478,190
1876	143,235	......	560,411	703,646
1877	190,170	6.458	523,128	719,756
1878	4,888,104	2,222	276.445	5,166,771
Total	5.446,305	11,047	4,375,369	9,832,721

The value of the principal articles imported and exported in 1878 was as follows: *Imports*, — horned cattle, $2.200; machinery, $305,825; fire-arms and cartridges (for the Greek government), respectively, $1,159,300 and $2,004,500; mineral oil, $38,025. *Exports*, — fruits of all kinds, $246,759; wool, $21,153.

Finance. The public revenue of the kingdom for the year 1878 was 39,247,000 drachmas ($7,008,390); and the expenditure 41,067,825 drachmas ($7,333,540). Since the establishment of *G.* as an independent kingdom, there have been few financial terms without a deficit. The constantly recurring excess of expenditure is due in great part to the excessive number of government officials, the total, as before stated, being one twelfth of the total population. *G.* has a very large public debt, consisting in part of unpaid arrears of old loans. In the expenditure of 1878 the interest paid on the foreign debt was entered for 1,246,000 drachmas, or $222,500, and that on the internal debt for 7,287,749 drachmas, or $1,303,385, being a total of 8,533,749 drachmas, or $1,523.885, equal to more than one fifth of the total expenditure. Interest is paid on but a small portion of the foreign debt. The total debt, foreign and internal, was as follows at the beginning of 1879: —

	Drachmas.
Foreign debt	335,513.422
Internal debt	94,569,480
Total	430,082,902
	$78,800,515

The principal portion of the foreign debt of *G.* consists of a five per cent loan taken in 1824 by Messrs Andrew Loughnan and Co., at 59, and of another of $10,000,000, taken in the following year by Messrs. J and S. Ricardo and Co. at 56½. On the former the dividends have been wholly unpaid since July, 1826, and on the latter since January, 1827, a period of over fifty years. A proposal was made in 1878, by the Greek government to the holders of these loans, — chiefly English and Dutch, — to set aside $375,000 annually for payment of dividends and of arrears, but it was on condition that assistance be given for the issue of a new five per cent loan of $10,000,000. The loan of 1862, guaranteed by England, France, and Russia, upon the elevation of the present king of Greece to the throne, amounting to $11,718,750, was contracted through Messrs. Rothschild. Upon this the dividends have been regularly paid, but only from reserved funds of the loan itself in the first instance, and since then chiefly from the treasuries of the guaranteeing powers, who are now, therefore, in each case heavy claimants upon the Greek government. The guarantee is not by the powers jointly, but is distinct in each case for a third of the loan. By the terms of a convention signed in 1866, it is arranged that the government of *G*, instead of fulfilling its original engagement to provide half-yearly for the interest and sinking fund of the above loan, should pay to the three guaranteeing powers not less than $180,000. Besides its funded debt, *G.* has a floating debt of the estimated amount of 50,000,000 drachmas, or $8,928,570.

Banking. The national bank was founded at Athens in 1842, the capital being in the first instance fixed at 5,000,000 drachmas. Branches have since been opened at Syra and Patras. The exchange operations throughout the country are ruled chiefly by the transactions at Athens, where bills on

London, Paris, Marseilles, Trieste, etc., are negotiated with facility. The most serious hindrance to the progress of industry in *G.* is the high rate of interest. The legal rate is 10 per cent for ordinary loans, and 12 per cent in commercial business. High as this is, most of the loans are effected at still higher rates, and the government cannot suppress the usury.

Money, Weights, and Measures. The unit of money is the *drachma*, of 100 *lepta* = \$0.193. The principal weights and measures are as follows: —

The *Oke*	=	2.80 lbs. advoirdupois.
" *Cantar*	=	123.20 " "
" *Livre*	=	1.05 " "
" *Baril* (wine)	=	16.33 imperial gallons.
" *Kilo*	=	0.114 imperial quarter.
" *Pike*	=	⅞ of an English yard.
" *Stremma*	=	¼ " " acre.

Seaports. The principal are Missolonghi and Galanidi, on the W. coast of Hellas; Piræus (the port of Athens), on the E. coast of Hellas; Nauplia, Patras, and Corinth, in the Morea; and Corfu, Zante, Syra, Hydra, and Spezzia, in the respective islands of these names. Of these the chief are the following: —

Corfu, the ancient Corcyra, the most important, though not the largest, of the Ionian islands. It lies between lat 39° 20′ and 39° 50′ N., and lon. 19° 35′ and 20° 6′ E.; off the S. part of the coast of Albania, from which it is separated by the Channel of Corfu, only ⅞ of a m. wide at its N. extremity, 6 m. at its S. extremity, and 15 m. in the centre. Corfu is 41 m. in length from N W. to S. E.; its greatest breadth is in the N., 20 m. The surface is hilly; the peak of St. Salvador, in the N. W., rises 2,979 feet above the sea. The streams are small, and mostly dried up in summer; climate mild. The most elevated lands are rugged and barren, but the plains and valleys are fertile. Oil is the great staple of this isle, which has, in fact, the appearance of a continuous olive wood. The city and port of Corfu lie on the E. side of the island, on the channel, which is here about 5 m. wide. The channel has deep water throughout; its navigation, which is a little difficult, has been much facilitated by the erection of a lighthouse on the rock of Tignoso in the northern entrance, where the channel is less than a mile in width; and by the mooring of a floating light off Point Leschino, in the southern entrance. Ships anchor between the small but well-fortified island of Vido and the city, in from 12 to 17 fathoms water. Pop. of city, 26,000.

Patras, in the N. W. corner of the Morea, near the entrance of the gulf of Lepanto, lat. 38° 14′ 25″ N., lon. 21° 46′ 20″ E. The port lies a little to the northward of the town; but the part fronting it is unsafe, and exposed to heavy seas, particularly in winter. Vessels, therefore, go a little farther up the gulf, where there is a mole, or quay, and where they can lie close to the wharf. There is a lighthouse on the mole, which gives a flash every two minutes. It is 55 feet above high-water mark, and is visible for 7 miles. Patras has a more extensive trade than any other port of *G.* Pop 15,000.

Syra, the ancient Syros, whose salubrity and fertility have been celebrated by Homer, one of the islands of the group called the Northern Cyclades, 15 m. W. from the greater Delos, its port, on the E. side of the island, being in lat 37° 26′ 30″ N., lon. 24° 57′ E. It is from 9 to 10 m. in length, by about 5 in breadth. Though rugged, it is carefully cultivated, and produces garden stuffs, wine, olives, figs, cotton, etc The population, from 4,500 in 1830, had risen to 26,817 in 1879. It is indebted for this extraordinary increase of population to the convenience and excellence of its port and its central situation, which have made it a considerable commercial entrepôt. Though small, its harbor is accessible to line-of-battle ships. The holding ground is good, and it has in its centre about 10 fathoms water. Merchantmen of from 400 to 500 tons burden moor within about 100 yards of the wharves. Winds from the S. E. round to E. N. E. throw in a heavy swell; but the port is well protected from winds from all other points. A lighthouse, with a revolving light, visible 20 m. off, has been erected on Gaidaro island, about 1½ m. S. E. from the port, and there is a red fixed light on the East Mole. Most part of the trade that formerly centred at Scio is now carried on here; and the island has not only received numerous immigrants from Scio, but also from many other parts of Greece. Most European powers have consuls in Syra, and it also is the principal seat of the Protestant missionaries to the Levant. The town, which is on the N. side of the harbor, has an appearance of great bustle and animation.

Zante, one of the Ionian islands, is 23½ m. long, and from 6 to 11 broad. In its aspect it is the finest of these islands, presenting, when viewed from the fort above the town of Zante, a prospect of vales and eminences richly cultivated, and covered with hamlets or villages embowered in olive plantations. The port and city of Zante are situated on the E. side of the island, in lat. 37° 27′ N., lon. 20° 54′ 42″ E. The city extends along the shore for nearly 1½ m., but it is nowhere above 200 yards in breadth, except where it ascends the hill on which the citadel is erected. The style of building is chiefly Italian; and the interior of the city displays everywhere great neatness, and even a certain degree of magnificence. It has a mole or jetty of considerable utility, at the extremity of which a lighthouse is erected; and a lazaretto, situated a little to the S. W. The harbor is capacious. Ships anchor opposite the town at from 500 to 1000 yards' distance, in from 12 to 15 fathoms, availing themselves of the protection of the mole when the wind is from the N E. Pop. 23,000.

Green, one of the prismatic colors, produced by combination of blue and yellow rays, is very common in the vegetable kingdom, but very rare in the mineral. There is only one metal, copper, which affords in its combinations the various shades of green in general use. The other metals capable of producing this color are chronium in its protoxide; nickel in its hydrated oxide, as well as its salts, the seleniate, arseniate, and sulphate; and titanium in its prussiate.

Green Dyes. See DYEING.

Green Pigments. Several of the *G.* pigments of commerce are obtained from copper. Oxide of chromium furnishes some which are very beautiful. Many are formed by the mere mechanical admixture of blue and yellow pigments. The bright blues and yellows, when mixed in this way, produce the liveliest *G.*; orange, or red and blue, and the yellowish browns and blue, the more dingy *G.* In this way are produced all the extemporaneous *G.* of the artist. Nickel and titanium also furnish *G.* colors, but these are not in common use. The following list embraces all the best known and most useful *G.* pigments: *Barth's G.* consists of yellow lake, Prussian blue, and clay, ground together. *Bice G.*, same as mountain *G.* *Bremen G.* is properly *G.* verditer, but other preparations are frequently sold under the name. *Brighton G.* is a mixture of impure acetate of copper and chalk. *Brunswick G.* is probably a crude chloride of copper, but a mixture of carbonate of copper and alumina or chalk is commonly sold under the name. *Chrome G.* The superb *G.* pigment used by enamellers under this name is the *G.* oxide or sesquioxide of chromium. *Emerald G.*, same as Schweinfurt *G.* *Frise G.* resembles Brunswick *G.* *Gellart's G.* is a mixture of cobalt blue and flowers of zinc with some yellow pigment. *Imperial G.*, same as Schweinfurt *G.* *Iris G.* is a very fugitive pigment, prepared by grinding the juice of the petals of the blue flag with quick-lime; *Lake G.* (see LAKE); *Mineral G.*, same as mountain *G.* *Mitis G.* is another of the many synonyms of Schweinfurt *G.* *Mountain G.* is properly the native *G.* carbonate or bicarbonate of copper (malachite) ground to powder, either with or without the addition of a little orpiment or chrome yellow. That of commerce is commonly prepared by adding a solution of carbonate of soda, or of potassa, to a hot mixed solution of sulphate of copper and alum. *Neuwieder G.* is Schweinfurt *G.* mixed with gypsum or sulphate of baryta. *Prussian G.* is a mixture of Prussian blue and gamboge. *Rinman's G.* resembles that of Gellart. *Sap G.* is a very fugitive pigment, prepared from the juice of buckthorn berries. *Scheel's G.* is an arsenite of copper. *Schweinfurt G.* is the aceto-arsenite of copper, prepared as follows: Acetate of copper and arsenious acid, equal parts, are each dissolved separately in the least possible quantity of boiling water, and the solutions mixed whilst still as hot as possible; an olive-green precipitate falls, which, by being boiled in the liquor 5 or 6 minutes, changes to a dense granular powder of a superb green color. This is a very fine, permanent *G.* pigment. "A great deal of needless alarm," says Watts, "has been excited about its supposed deleterious effects. It is extensively employed for staining wall-papers,

and persons inhabiting rooms thus papered are said to have had their health seriously deranged by the arsenical fumes evolved from it. Now, it is utterly impossible that arsenic could volatilize from such a compound at ordinary temperatures; it does not decompose at any temperature below redness." It is, however, probable that the air of such apartments is sometimes charged with the poisonous pigment through its becoming detached from the paper. To breathe an atmosphere so impregnated would be dangerous. The use of paper colored with Scheele's or Schweinfurt *G.*, especially the kind called "flock," should, therefore, be carefully avoided. *Verona G.* is the mineral called *G.* earth. *Vienna G.*, the same as Schweinfurt *G.* See also ANILINE COLORS, VERDIGRIS, and VERDITER.

Greenback, a popular name for the paper-money first issued by the government of the U. States in 1862, the engraved backs of which are printed with green ink.

Green Bay and Minnesota R.R. runs from Green Bay, Wis., to Winona, Minn., 213.9 m. This Co., whose offices are in Green Bay, was chartered in 1866 and the road opened in 1873. A portion of the La Crosse, Trempeleau, and Prescott R. R. from Winona to La Crosse, 29.7 m. in length, is operated under lease by the Co., which is at present in the hands of a receiver. *Financial statement:* Cap stock, $8,000,000; funded debt, $3,979,000 as follows, — 1st mortgage bonds, issued 1870, $3,200,000, payable 1900, interest 7% (Aug. and Feb.); 2d mortgage bonds, issued 1873, $779,000, payable 1893; interest 8% (May and Nov.).

Green-Cloth, green baize, etc., used for covering tables.

Green-Crops, plants which are grown on a farm to be consumed before they are fully ripe or come to maturity, as turnips, carrots, etc.

Green-Earth, a variety of talc, also called *seladonite*, known by artists under the name of mountain green. See GREEN.

Green-Ebony, a wood obtained from the *Jacaranda ovalifolia*, a native of the West Indies, and used both as a hard turning-wood and as a dye-stuff.

Green-Gage, a kind of plum of a green color; the Claudiana variety of the *Prunus domestica.*

Green-Grocer, a retail dealer in vegetables and fruit in their fresh or green state.

Greenheart, a common tree of Guiana, the *Nectandra rodiæi;* its timber, squaring from 18 to 24 inches, can be procured without a knot from 60 to 70 feet long. It is a fine-grained hard wood, well adapted for the planking of vessels, house frames, wharves, bridges, and other purposes, where great strength and durability are required. It is the best timber for resisting tensile and compressive strains, and is therefore well adapted for kelsons of ships, and beams of all kinds. The black greenheart is considered more durable than the common greenheart. The bark yields bibcrine, the sulphate of which is used like the sulphate of quinine.

Greenhouse, a conservatory or glazed house for rearing and protecting plants from changes of temperature.

Greenland. See DENMARK.

Greenock. See GREAT BRITAIN (Seaports).

Green Paints or **Pigments**. See GREEN.

Green-Room, the actors' retiring or meeting room in a theatre.

Greens, a common name for small young cabbages which have not formed the leaves into full hearts.

Green-Sand, a silicious stone found in the Blackdown Hills of Devonshire, England, used as a whetstone for scythes, etc.

Greensward, a grass-plot.

Green-Tea, a commercial variety of tea imported from China, of which there are several kinds; the principal being Twankay, an inferior description, Hyson-skin, Hyson, and young Hyson, imperial, and gunpowder. See TEA.

Green Turtle. See TURTLE.

Greenville and Columbia R.R. runs from Columbia, S. C., to Greenville, S. C., 143.5 m., with a branch from Cokesburg to Abbeville, 11.5 m., and another from Belton to Anderson, 9.8 m.; total, 164.8 m. The Laurens R.R. is operated by this Co., which has also a controlling interest in the Blue Ridge R.R. This Co., whose offices are in Columbia, was chartered in 1846, and the road was opened in 1853. The road passed into a receiver's hands in 1878. *Financial statement:* Cap. stock, $1,515,165.54; funded debt, $2,178,763.32, consisting of, — past due, 1st mortgage bonds, $236,000; 2d mortgage bonds and certificates, $103,060.58; non-mortgage bonds, $140,000; state guaranteed bonds and certificates, $1,413,071.55; funded interest bonds, $163,131.19; and 1st mortgage bonds, payable 1895, $123,500.

Greenwich, a fire-insurance Co., located in New York City, organized in 1834, reorganized under the general act and an amended charter, 1864. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $344,301.10; total cap. and surplus, $544,301.10; risks in force, $46,440,586; premiums, $203,305.23; premiums received since the organization of the Co., $3,186,-069.26; losses paid, $1,281,614.95; cash dividends paid to stockholders, $1,518,000; cash dividends paid during the year, $60,000.

Greffier, a registrar, or recorder in a French court of justice.

Gregarious, herding together, or living in flocks, as domestic cattle, birds, etc.

Grege, a French term applied to raw silk.

Grelin [Fr.], a small cablet or line for a boat.

Grenache. See ROUSSILLON (WINES OF).

Grenade, a hollow ball or shell of metal, filled with powder, having a burning fuse attached, thrown by hand amongst enemies.

Grenadier, a tall foot-soldier wearing a high cap; one originally employed to throw grenades.

Grenadine, a gauzy dress-goods, of silk or wool, plain, colored, or embroidered.

Grenat [Fr.], dried lemon-peel.

Greyhound, a slim-made dog kept for coursing, remarkable for swiftness, strength, and sagacity in pursuing game.

Griddle, Riddle, a miner's wire-bottomed sieve for separating the ore from the halvans.

Gridiron, a kind of frame for drawing up a ship on to be docked and repaired. — A frying and grilling iron grated frame for cooking chops, steaks, fish, etc., over a fire.

Grilling, the operation of broiling meat over a fire.

Grilse, a young salmon.

Grimellino, a small money of account in Tripoli, of 4 aspers.

Grinder, a sharpener and polisher of edge-tools. — The large teeth that masticate food. Elephant's grinders are used for making knife-handles.

Grindery Warehouse, the name in England for a finding-store.

Grinding, the operation of reducing substances to powder by friction or attrition. *G.* is the most unhealthy of all trades in steel manufactures, ow-

ing to the tendency of metallic and stony particles to enter the lungs. At Sheffield a *G.* mill or establishment is usually called a *wheel;* the distinct rooms in it are called *hulls;* and the distinct grindstones in each hull, *troughs.* One system of steam-power works all the grindstones; and the grinder pays a rent for the space and the power supplied to him. The grindstones are from 6 to 24 inches in diameter, turning on square iron horizontal spindles. They are made of various kinds of sandstone grit, and each kind suited for *G.* some particular sort of steel work. In most instances the grinder sits astride a plank called a *horse*, and has facilities for applying water to the grindstone while using it. Some steel goods require large grindstones, some small (razors the smallest); some need wet grinding, some dry. Most fine cutlery, as well as forks and needles, require dry *G.*; and this renders these trades particularly hurtful, on account of the dry steel dust floating about, a fork-grinder seldom surviving his thirtieth year. Small grindstones give concave surfaces, which in their turn give sharper edges. Large stones grind more rapidly than small, and dry more rapidly than wet; the grinder knows by experience which is best. Other kinds of *G.* are very numerous, — such as *G.* glass lenses, glass plates, telescopic specula or reflectors, diamonds and other gems, plane surfaces of cast or rolled iron, gun-barrels, steel pens, needles, etc. See the headings relating to the substances operated upon; see also EMERY. — In the laboratory, the term is chiefly applied to powdering by means of a mill or by mechanical power, in opposition to simple pounding or trituration in a mortar or with a slab or muller. All the principal powders, paints, etc., sold by the druggist and colorman, are reduced in the drug or color mill.

Grinding-Slips, hones; a kind of oil-stone.

Grindstone. See GRINDING.

Gripes, bars of iron with lanyard rings and claws, by which a large boat is lashed to the ring-bolts of the deck.

Grisette, a common brown French stuff fabric, worn by females of inferior class; whence the transfer of the name to the wearer.

Grist, as much grain as is carried to the mill at one time for family use, or the meal it produces.

Grist-Mill, a name for a flour-mill; especially a mill for grinding grists, or portions of grain brought by different customers.

Grit, hard sandstone employed for millstones, grindstones, pavement, etc.; gravel. — The coarse part of meal.

Gritty, earthy; containing sand or grit; flour or meal having pieces of stone, etc., mixed with it.

Groat, a small English silver coin, equivalent to 4*d.*, first minted in the reign of Edward I. A very large quantity of *G.* were coined in 1854-5, and none since.

Groats, decorticated oats; hulled and peeled barley.

Grocer, a dealer and vender of sugar, spices, dried fruits, and other comestibles, or articles of food for the table; usually combined with the sale of coffee and tea.

Groceries, the comestible wares, or general commodities sold by a grocer.

Grog, a sailor's name for rum, whiskey, or other spirituous liquor, diluted with water and unsweetened.

Grogram, a fabric made of silk and mohair, and having a coarse grain or texture.

Groin, a framework of wood across a beach to retain the accumulated shingle. — The point of junction in two semi-cylinders or arches.

Grommet, a ring formed of rope, by laying round a single strand; used to fasten the upper edge of a sail to its stay.

Groom, a stable attendant; one who has the care of horses; a gentleman's servant or outrider.

Groove, a channel, or long hollow furrow cut by a tool. — A shaft or pit sunk by miners.

Grooved, furrowed or channelled.

Gros-de-Naples [Fr.], a plain silken fabric made of organzine silk, and woven with much neatness and care.

Gross, in merchandise the whole weight of goods, including box, package, baling, etc. — The number of 12 dozen, which is the small gross, but the great gross is 12 times 12 dozen.

Ground, land. — The color first put on the surface. — The prevailing color of a fabric, building, etc. — The first layer of color in a painting. — Flush strips in plastering for the attachment of moulding and other finishing. — In navigation, to touch the bottom. — In the plural: the dregs or feculencies deposited at the bottom of liquids; as coffee-grounds.

Ground-Bait, pastry, bread, or other substances, cast to the bottom of water to entice fish.

Ground-Blood, a preparation of blood largely used as a fertilizer, consisting of blood divested of its water, and ground.

Ground-Floor, the story or floor of a house level with the ground.

Ground-Glass, glass whose surface is ground, so as to break up the pencils of light passing through it, preventing the passage of a distinct image. Lamp globes are ground in order to mellow and disperse the light passing through them. The process is done mechanically or chemically: the wheel, sand-blast, by rotating with pebbles inside, or by fluoric acid. — *E. H. Knight.*

Ground-Joint, a joint for fitting certain surfaces by rubbing them with fine-grained emery and oil.

Ground-Nut. See PEANUT.

Ground-Plan, the surface representation of the divisions of a building.

Ground-Plot, the land on which a building stands; the plan of the ground.

Ground-Rattan, a kind of cane, the stem of *Rhapis flabelliformis.*

Groundsel, a common wild plant, the *Senecio vulgaris;* the stalks, containing the ground buds, seeds, and leaves, are collected and sold to feed canaries and other cage-birds. — The timber or sill of a building resting on the earth.

Ground-Tackle, a general name for the appliances and gear used in securing a vessel at anchor, comprising cables, ways, springs, anchors, etc.

Ground-Tier, the lowest tier of casks in a vessel's hold. — The pit range of boxes in a theatre.

Groundwork, the earthwork or foundation; the commencement of any operation.

Grouse, a large family of birds, many of which are much esteemed. To this family belong the Wood *G.*, Cock of the Wood or Capercailzie (*Tetrao uregallus*); the prairie-chicken (*T. cupido*) of our western prairies; and the American partridge (*Bonasa umbellus*).

Grout, coarse meal; pollard. — A thin mortar, a mixture of quick-lime and fine sand, used for mouldings and finishing ceilings.

Grove, a small shady wood.

Groyne, a sea-wall, or defence against the encroachments of the tide. See GROIN.

Gruan [Fr.], oatmeal; water-gruel.

Gruans, wooden vessels used in salt manufactories in France. — Wheat flour coarsely ground, so as to free it from husk.

Grub-Axe, a hoe or field tool for digging up weeds.

Grubber, a kind of heavy cultivator, used in Scotland for stirring and loosening the soil to plough depth.

Grub-Saw, a hand-saw used for sawing up marble slabs into strips, such as shelves, mantel-pieces, etc.

Grubstone Mortar. See BETON.

Grunter, an iron rod bent like a hook, used by iron founders.

Gruyère. See CHEESE.

Guacho, a South American mounted herdsman, or cattle-hunter.

Guadeloupe, or **Guadaloupe**, one of the leeward group of islands in the West Indies, belonging to France, and situated in lat. 16° 20′ N., lon. 62° W. It consists properly of two islands, separated from each other by a narrow channel, about 5 m. in length by from 30 to 100 yards wide, and with depth sufficient for vessels of 60 tons. This channel, called *La Rivière Salée*, or Salt River, runs nearly N and S., and has a large bay at each end, that on the N. being called the *Grand Cul-de-Sac*, that on the S. the *Petit Cul-de-Sac*. The western or larger island, called *G.* proper or *Basse Terre*, is 27 m. in length by 15 m. in breadth; the eastern, or *Grande Terre*, is nearly 30 m. long by from 10 to 12 broad. Total area (with dependencies), 1,645 sq. m. The government consists of a governor, with a privy council of 6, and a colonial council of 30, members. Pop. 151,594.

G. proper is of volcanic formation, and is traversed from N. to S. by a ridge of hills having a medium height of 2,296 feet. Its principal peak is *La Souffrière*, an active volcano 5,108 feet high. It is copiously watered by numerous small streams, two of which, the *Goyade* and the *Lezarde*, are navigable for small craft. The soil is fertile, and the surface is agreeably diversified by hill and dale, wood and garden. The products, natural and cultivated, are those of the West Indies generally The principal town, *Basse Terre*, stands on the S. W. coast. It is the residence of the governor, and has some fine public buildings, fountains, and gardens, and has about 8,000 inhabitants. *Grande Terre*, unlike *G.* proper, is marshy, sterile, and flat, nowhere rising more than 115 feet above the sea. Its chief town, *St. Louis*, or *Pointe à Pitre*, the former capital of the island, is at the S. entrance to the Salt River, and has an excellent harbor. It formerly contained about 15,000 inhabitants, but was almost entirely destroyed by an earthquake in 1843. The climate is humid, and hurricanes and earthquakes are frequent. The rainy season lasts from the middle of July to the middle of October. The chief exports are sugar, molasses, rum, cotton, coffee, dye-woods, and copper. The sugar crop amounts to about 60,000 hogsheads annually.

The commercial intercourse of *G.* with the U. States is relatively considerable. For the year 1878 the value of imports from this country was $1,569,880, and of exports $2,881,059. The principal articles entering in these figures were as follows: *Imports from the U. States:* Agricultural implements, $2,163; horses, $17,668; mules, $82,670; bread-stuffs, $593,370; cotton goods, $40,674; hay, $1,716; ice, $8,730; leather of all kinds, $53,865; saddlery, $1,680; manures, $11,531; matches, $1,345; mineral oil, $39,942; plated ware, $1,533; bacon and hams, $29,861; salted beef, $20,693; fresh beef, $42,537; butter, $3,188; dried fish, $71,211; pickled fish, $16,993; cured fish, $14.508; lard, $56,818; preserved meat, $3,468; pork, $77,074; onions, $1,375; potatoes, $1,984; tobacco leaf, $102,464: tobacco (manuf.), $4,988; wood (boards, laths, shingles, etc.), $231,245; household furniture, $10,795. *Exports to the U. States:* Gold coin, $651,220; fruits, $4,135; salt, $1,194; brown sugar, $2,807,827; molasses, $41,000.

The government of *G.* comprises, besides that island, those of *Marie-Galante*, *Desirade*, *Les Saintes*, and the N. portion of *St. Martin* (the S. portion belonging to the Dutch). *Marie-Galante* lies 14 m. S. S. E. of *G.*, and is about 12 m. in length by 8 in breadth. It is traversed from N. to S. by a range of hills running parallel to the E. coast, where it presents a front of high and precipitous rocks. The W. and N. sides of the island are level; and parallel with the former is a narrow lagoon, 7 or 8 miles in length, separated from the sea by a low, narrow tract of land. The island abounds in woods, particularly the wild-cinnamon tree. Its principal town, *Grand-bourg*, or *Basse Terre*, stands near the S W. point. — *Desirade*, or *Deseada*, lies about 4 m. E. from the S. E. extremity of *Grande Terre*, and is about 8 m long by 3 wide It rises from the sea with a steep ascent, and then extends in a table-land, which consists of limestone rocks, in which many caverns occur, but it is without water The soil in some places is of a deep black mould, and fertile: in others it is sandy and unproductive. The only anchorage is at the *Anse-Galet*, on the E. side of the island. — *Les Saintes* are a group of rocky islets 6 or 7 m. S. of *G.*, and consist of lofty and steep peaks, some of which are united by flat ground and ridges of inferior elevation. The two largest are called *Terre d'en Haut* and *Terre d'en Bas*. — *St. Martin* is a small island immediately S of the British island of Anguilla, in lat. 18° 5′ N., and lon. 63° 6′ W. Its form is nearly that of an equilateral triangle, each side being about 7 m. in length. It is deeply indented with bays and lagoons, some of which afford good anchorage. The surface is generally hilly, the highest point being 1,361 feet above the sea.

Guaiacum, a fine evergreen tree (*Guaiacum officinale*) of the West Indian Islands, particularly Cuba, San Domingo, and the S. side of Jamaica. The wood is remarkable for its hardness, toughness, and durability; qualities which render it particularly valuable for many purposes. It is known in commerce as *lignum vitæ*. This wood and a resin obtained from it are officinal in our pharmacopœias, and are commonly known in the shops respectively as *G.-wood* and *G.-resin*. The latter is generally procured by heating the wood, either by boiling chips in salt water, or more commonly by burning hollow billets, and catching the resin as it flows out from them. It also exudes to some extent spontaneously, and especially so when the tree is cut or wounded in any way. *Imp.* free.

Guallaga, a name in San Domingo for the *Zamia media* plant, from the root of which starch is obtained and exported.

Guana, a common name for a large species of tree lizard, the *Iguana tuberculata*, which is esteemed for its delicate flesh, and the skin is often tanned.

Guanaco, a variety of the alpaca, the *Auchenia huanaca*.

Guano, a substance extensively used as a manure, consisting of the partially decomposed excrement of certain aquatic birds, chiefly the common penguin, which congregate in countless numbers on the barren and uninhabited islets and rocks of South America and the coasts of Africa. It abounds in ammonia and the phosphates, and is undoubtedly the richest natural manure known. Under judicious application, the increase of the crops of grain, turnips, potatoes, and grass consequent upon its use is said to be about 33 %. *G.* is particularly adapted to horticultural and floricultural improvement, by its relative cleanliness and facility of application. Several of the South American *G.* beds are now exhausted, but new varieties are constantly being introduced; and although the qualities are continually varying, *G.*, on the whole, may be divided into two classes, the one characterized by the abundance of ammonia, the other by that of phosphates, the Peruvian and Anganos being characteristic of the former, and the Saldanha Bay and Bolivian of the latter. In selecting a *G.* the following points ought to be attended to: 1st. The *G.* should be light-colored and dry, coloring very slightly when squeezed together, and not gritty. 2d. It should not have too powerful an ammoniacal smell, and should contain lumps which, when broken, appear of a paler color than the powder. 3d. A bushel should not weigh more than from 56 to 60 pounds. These characters are, however, imitated with great skill, so that they cannot be implicitly relied upon, and they are applicable to Peruvian G. only.

Adulteration and Test. *G.*, owing to its high price, is very commonly adulterated, or is in an advanced stage of decomposition when sold. Much of what is vended under the name is

altogether a fictitious article. These artificial mixtures are made to look so like genuine *G.*, that the mere practical man, who goes only by their appearance, is very often deceived by them, and, owing to the failure of his crops in consequence, is led to distrust the efficacy of *G.* as a manure. Vessels which sail hence for the *G.* stations are very commonly ballasted with rough gypsum, or plaster of Paris. This substance is mixed with the *G.* as it is loaded, and enables the importers to deliver from the vessel a "nice-looking, light-colored article." Purchasers of *G.* are very desirous of having it delivered from the vessel, as they believe they thus obtain it pure. The favorite material for the adulteration of *G.*, at the present moment, is a variety of umber, which is brought from Anglesea (an island of Wales) in large quantities. The rate of admixture is said to be about 15 cwt. of umber to about 5 cwt. of Peruvian *G.*, from which an excellent-looking article is manufactured, which is sold under the name of "African *G*." Pure *G.* has a pale-brown color, a more or less offensive odor, and the average sp. gr. of 1.63 to 1.64. If the sp. gr. exceed 1.75 it is either damaged or adulterated; and if it is less than 1.62 it contains an undue quantity of moisture. The best is neutral to test-paper, and sometimes has even an acid reaction; but that of commerce has generally an alkaline reaction, owing to the presence of free ammonia, and, in consequence, turns turmeric paper brown, and gives white fumes when a glass rod dipped in hydrochloric acid is held over it. Triturated with quicksilver or caustic potassa, good *G.* evolves a powerful odor of ammonia; digested in water, fully one half of it is dissolved; dried by the heat of boiling water, it does not lose more than from 7 to 9 % in weight; and burned upon a red-hot shovel, it leaves a white ash, not a red or dark-colored one. As its value to the agriculturist depends chiefly on its richness in ammonia, potassa, and phosphoric acid, the analysis of *G.* for practical purposes may be reduced to an assay for these articles. Indeed, the presence of ammonia (the most valuable of them), in the proper quantity, may be fairly taken as evidence of the presence of the rest. The following method of testing *G.* is both simple and accurate: 100 gr. of the sample for examination (fairly selected) are distilled along with about 75 gr. of fresh-slaked quick-lime, and a little water, in a small matrass connected with a tubular triple bulb-condenser, containing cold distilled water, and immersed in a basin of ice-cold water (Fig. 250). The condenser is charged by plunging

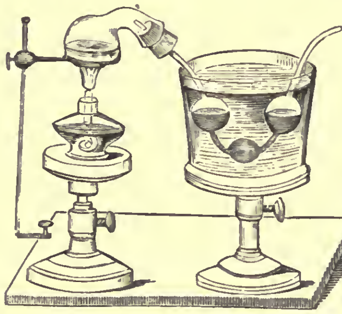

Fig. 250. — Analysis of Guano.

one of its extremities into the water, and sucking at the other until the liquid reaches the level indicated in the margin. A very gentle heat only, cautiously increased, need be employed. After the process is over, the strength of the solution of ammonia found in the condenser is tested by taking its density in a small specific-gravity bottle. This furnishes the percentage of ready-formed ammonia sufficiently accurate for all ordinary purposes, provided proper care is taken.

The imports of *G.* into the U. States for the year 1878 amounted to 23,123 tons, valued at $849,607, to which Peru contributed 20,982 tons, Venezuela 1,221 tons, and British Honduras 791 tons. *Imp.* free.

Fish-Guano. A manure of that name, said to be very effective, is manufactured by the U States Menhaden Oil and Guano Association, in Maine, Massachusetts, Rhode Island, Connecticut, Long Island, and New Jersey. According to statements from a report of that Association, 1,478,634 barrels of fish caught in one year, averaging 250 fish per barrel, have given, besides 3,372,837 gallons of oil, 50,976 tons of *F.-G.* A foreign market has been recently opened for this manure, and cargoes have been shipped from Maine to Liverpool.

Guarana, an alimentary and medicinal substance prepared from the seeds of *Paullinia sorbilis*, a Brazilian tree. The dried seeds, deprived of their aril, are pounded and kneaded into a mass, which is afterward made into oblong or rounded cakes, called *G. bread*. These cakes are used as we use chocolate, — mixed with water and sugar, and drank as a beverage. In Brazil this beverage is largely consumed, both on account of its nutritive qualities, and for its stomachic, febrifugal, and aphrodisiac effects.

Guarantee, he to whom a guaranty is made.

Guarantor, he who makes a guaranty; one who is bound to another for the fulfilment of an engagement by a third party.

Guaranty, an engagement to perform some act, or pay some debt, in case another person primarily liable fails to do so. To make such an obligation binding, there must be some good consideration moving from the party with whom it is made; as the delivery of goods to, or work to be done on credit for, the person on whose behalf the guaranty is given. It must be in respect of a contemporaneous or future debt or act. If a guaranty be made in respect of a debt already incurred, there must be a new consideration to support it. A consideration, however, need not be expressed; for if it can be fairly implied from the circumstances, or the language used, it will ordinarily be sufficient. It is sufficient if the person for whom it is given receive a benefit, or may receive a detriment. The Statute of Frauds, re-enacted almost in terms in the several States, stipulates that a defendant cannot be charged to answer for the debt, default, or miscarriage of another person upon any special promise, unless the agreement upon which such action shall be brought, or some memorandum or note thereof, shall be in writing, and signed by the party charged therewith, or some other person duly authorized by him. This statute only applies, however, to engagements in which the guarantor is only liable conditionally upon the default of some other person: where he is liable co-extensively with the other party in the first instance, it does not apply. The construction of all such obligations is never extended beyond their obvious meaning, and they are only understood to apply to future, unless they expressly include past transactions. All their conditions and limitations must be carefully regarded, otherwise they become void. If so expressed or intended, however, such obligations may be of the most unqualified character; they may be unlimited in amount, and indefinite as to time. When the guarantor is compelled to pay, he has an action of relief against the principal debtor; but that party, being primarily liable, must first be sued by the creditor; and whatever he does toward the extinction of the claim of the creditor, or whatever the creditor recovers from him or his estate, goes so far to relieve the guarantor, who can also plead against the creditor any defence which could be competently pleaded by the principal debtor. Where more persons than one are bound together in a *G.* obligation, any of them seeking relief from the others of a share of his loss must communicate to them a share of any security which he may hold over the estate of the principal debtor, or of any abatement he may have obtained from the creditor. A *G.* obligation may be extinguished by the extreme neglect of the creditor; as, for example, by his failing to take advantage of a security in his power, omitting to negotiate a bill, inadvertently giving up funds of the principal debtor over which he had a right of lien or retention, or renouncing any security over his estate. In like manner, if he compound with, or discharge the principal debtor, without the concurrence of the guarantor, the *G.* is at an end.

Guarapo, a common beverage of the lower orders in Venezuela, made from the juice of the

sugar-cane, or with sugar and water which has undergone the vinous fermentation.

Guard, that which secures against injury, defacement, or loss; whence, the bowl or basket of a sword-hilt, or that which serves as a protection for the hand. — An ornamental hem, lace, edging, seam, or border. — The chain or ribbon which serves to fasten a time-piece, etc., to one's person; as a watch-*G.* — A kind of fine wire-grating or network, placed opposite to, or over, a hearth, etc.; as a fire-*G.* — A railing placed at the sides of a vessel, to prevent persons from falling overboard. — A safety-lock of a fowling-piece to prevent the accidental dropping of the hammer. — In machinery, a light frame in which the nuts of bolts fit to prevent their unscrewing by the vibration of the engine. — In bookbinding, one of the slips of paper bound in with a blank book to thicken it at the back, when the leaves are intended to contain slips, or drawings.

Guard-Boat, a row-boat in a harbor, or among vessels at anchorage.

Guardian, a protector; one chosen or appointed, by statute or by will, to take charge of the estate or education of an orphan or ward, or a person who is imbecile or otherwise incompetent to manage his own affairs.

Guardian, a fire-insurance Co., located in New York City, organized in 1865. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $35,343.87; risks in force (fire), $9,983.216; premiums, $64,235.34; inland risks $16,250; premiums, $593.75; premiums received since the organization of the Co., $1,105,722.02; losses paid, $664,166.70; cash dividends paid to stockholders, $171,000.

Guatemala, one of the five republics of Central America, extending from lat. 13° 50′ to 18° 15′ N., lon. from 88° 14′ to 93° 12′ W. It is bounded N. by the Mexican State of Chiapas, E. by British Honduras and the Caribbean Sea, S. by the republics of Honduras and San Salvador, and S. W. by the Pacific Ocean. By the terms of the constitution proclaimed Oct. 2, 1859, the legislative power is vested in a congress of two chambers, called the Council of State and the House of Representatives. Both chambers are elected for 4 years, the House of Representatives by the people, and the Council of State by the House. The executive is vested in a President, also elected for 4 years. The area of *G.* is estimated at 41,830 sq. m. According to a rough enumeration taken on Jan. 31, 1872, there were at that date 1,190,754 inhabitants, of whom 360,608 were of European descent, and 830,-146 aborigines, or Indians. *G.* is administratively divided into 17 provinces, of which 3, Escuintla, Sololá, and Suchitepeguez, are on the Pacific Ocean, 1, Yzabal, borders the Atlantic, and the rest are inland. The capital of the republic and seat of the government is Santiago de Guatemala, or Guatemala la Nueva, with 45,000 inhabitants, a tenth of them of European origin. The former capital, Santiago de Caballeros, or Guatemala la Antigua, which had once a population of 60,000, was partly destroyed by fire and earthquakes in 1773, and has now only 20,000 inhabitants.

The surface of *G.* is wholly mountainous, the main chain of the continuation of the Andes traversing it from S. E. to N. W. at an inconsiderable distance from the Pacific shore, and branching off in various ramifications toward the Atlantic: forming many valleys, but enclosing few plains. Along the main chain occur numerous volcanoes, all near the Pacific. The culminating point of the surface is in N. lat. 15° 30′, between the towns of Totonicapán and Gueguetenango. The E. border of the plateau descending to the Gulf of Honduras is cut by deep valleys, which extend to a great distance, and in some places advance to the very shores. The country lying to the W. and the N. W. of the Golfo Dulce is a low plain, while all between the plateau and the Bay of Honduras is a succession of ridges and valleys. In many places the shore is rocky, with rocky barriers lying off it. Numerous streams drain this State. The most important are the Lacantun, forming part of the Mexican boundary; the Motagua and the Polochic, which fall through the Dulce into the Bay of Honduras. The most important lakes are the Dulce, advantageous for foreign trading vessels; the Amatitlan, 18 m. S. E. of *G.*, is 9 m. by 3, of great depth, and is much resorted to as a bathing-place by the inhabitants of *G.* from February till April; near it there are several mineral and hot springs, the Atitlan, 80 m. N. W. of the city of *G.*, is about 20 m. long by 9 broad, surrounded by lofty heights, including the volcano of Atitlan, and is remarkable for its very great depth, and being without outlet, though several small rivers enter it; the Paten, near the frontiers with Yucatan, about 30 m. long, and 9 broad. The *climate* of the table-land is that of perennial spring, the thermometer scarcely varying throughout the year, and it resembles very much the climate of Valencia in Spain in almost every particular. In the northern part of the State, in what is called *Los Altos* (the highlands), the average is lower than any other part of the country. Snow sometimes falls in the vicinity of Quesaltenango, the capital of this Department, but soon disappears, the thermometer seldom remaining at the freezing-point for any considerable time. In the vicinity of the city of *G.*, the range of the thermometer is from 55° to 80°, averaging about 72° F. Vera Paz, the N. E. Department of *G.*, and embracing the coast below Yucatan to the Gulf of Dulce, is nearly 10 degrees warmer. This coast from Belize downward to Isabel and San Tome is hot and unhealthy. From May till October is the rainy season. Thunder prevails in June, and terrific storms from the S. W. sweep along the Pacific coast in August and September. Earthquakes are very frequent. The soil is generally very fertile, producing excellent rice, and all the cereals in great variety and abundance. Agriculture has remarkably progressed during the last ten years. As articles of commerce, the most important products are coffee, cochineal, and indigo. Cotton, cacao, sugar, vanilla, and tobacco are grown in considerable quantities. The cultivation of coffee is largely increasing, while that of cochineal is being abandoned. The table-land is almost destitute of trees and even bushes, except on the declivities of the hilly ranges which so extensively traverse it. Trees of very large size form extensive forests on the lower lands along the

Fig. 251. — Sea-Lavender.
(1/10 *natural size.*)

Pacific. These are a source of great natural wealth. Among the trees the most valuable are the cedar, mahogany, Brazil, Santa Maria, pimento, gualacum, etc.; and abundance of medicinal plants are also found and turned to some account. The vegetation is luxurious and vigorous along the low tract by the Bay of Honduras. There abound cactuses, palms, mimosas, etc. Mixed with these are numerous herbaceous flowers, of the most varied colors and elegant forms, of which the sea-lavender, *Statice elata* (Fig. 251) is a splendid and striking specimen. Sheep are reared in considerable numbers, especially over the northern districts, and their wool is used for native manufactures. The horse is small, hardy, and handsome;

and mules are numerous, being the chief beasts of burden. Pigs and poultry are very abundant, and of excellent quality. Salt is manufactured along the coast of the Pacific. Jasper, marble, and brimstone are obtained in considerable quantity in the vicinity of some of the volcanoes. Lead is worked by the Indians in Totonicapán. The manufactures are mostly limited to those for domestic use. The cotton manufacture is almost confined to the departments of *G.* and Sacatepec. Coarse woollen cloth is extensively manufactured, especially *gerga*, which is made into a peculiar black called *poncho*, in which much taste is displayed.

Commerce. The commercial intercourse of *G.* is chiefly with Great Britain and the U. States, the exports consisting of coffee, cochineal, indigo, and other agricultural produce, and the imports chiefly of textile fabrics. The exports for the year 1877 were of a total value of $3,773,183.74; comprising coffee ($3,358,956.16), cochineal ($181,693), woollen goods ($115,939.20), muscovado ($28,303), hides ($62,343.84), etc. These commodities were distributed among the various markets as follows: Great Britain, $1,073,977; California, $1,037,531; New York, $193,252; Germany, $819,910; France, $311,870; Belize, $181,660; Central America, $127,308; South America, $30,909. The chief sources of the imports and the values of these were as follows in the same year: Great Britain, $1,208,894.87; France, $458,162.44; Germany, $317,367.60; United States, $378,753.21.

The value of the commercial intercourse of *G.* with the U. States is not reported in the annual reports published by the Treasury Department at Washington, which summarize, under the heading of "Central America," the commerce of the 5 states of Costa Rica, *G.*, Honduras, Nicaragua, and San Salvador. The commercial intercourse of the whole of Central America with the U. States, for the year 1878, is as follows: *Exports from Central America to the U. States*, — chemicals, $20,509; cocoa, $23,415; cochineal, $5,811; coffee (13,868,955 lbs.), $2,473,178; dye-woods, $11,493; gold and silver coin and bullion, $101,393; gums, $4,300; hides and skins, $97,713; india-rubber, $131,170; indigo, $1,328; wood (not specified), $13,968; fruits, $27,643; brown sugar (2,545,042 lbs.) $114,434; others, $57,992; total, $3,070,389. *Imports from the U. States into Central America*, — horses, $1,200; beer, $4,594; blacking, $1,546; breadstuffs (chiefly wheat flour), $494,814; cordage, rope, etc., $7,367; cotton goods, $92,184; drugs, $18,044; earthenware, $4,621; fancy articles, $4,701; preserved fruits, $6,119; glassware, $6,514; gold and silver coin, $272,608; hats, $2,352; stoves, $1,449; machinery, $69,846; edge-tools, $5,541; lamps, $2,055; boots and shoes, $13,758; saddlery, $6,152; matches, $5,785; organs, $1,500; mineral oil, $20,518; gunpowder, $5,014; paints, $4,312; paper, $6,224; bacon and hams, $7,763; salted beef, $5,821, butter, $4,701; cheese, $3,099; cured fish, $4,786; lard, $9,771; preserved meats, $6 766; pork, $9,538; potatoes, $4,292; quicksilver, $24,290; sewing-machines, $12,535; soap, $7,852; refined sugar, $12,692; tallow, $26,853; tobacco (leaf), $3,908; tobacco (manuf.), $7,966; steamers, $30,000; wine, $11,769; wood (boards, deals, etc.), $42,573; manuf. of wood, not specified, $12,924; household furniture, $20,303; others, $122,314; total, $1,479,788.

Our trade with this favored region has increased considerably, but owing to the want of direct communication it is still far from being as extensive as it should be.

A decree has been issued by the government granting a premium of four reals per quintal (100 lbs.) of muscovado sugar exported. The cultivators of sugar in *G.* have enormous difficulties to contend against as compared with Peru or the West Indian Islands. The price of labor is so much higher than cooly labor, and the freights both on land and sea are so much heavier, that it is only by the most determined perseverance and industry that they are able to obtain a scanty recompense from their crops. A privilege has been granted for a term of five years to a company for the introduction of machines and the establishment of factories for the manipulation and perfection of manufactures from the textile plants of the country. These exist in great abundance in several of the departments, and the inhabitants have to some extent endeavored to utilize them. The concession in question is not intended to interfere with the employment of the methods now in use by the Indians and others, but rather to improve and perfect them, or, so far as the concessionists are concerned, to adopt those that may be new. The privileges received guarantee freedom from all duties on machinery and materials, and also from export duties on all fabrics, etc., which may be made and shipped abroad by them. A concession has been made to encourage the manufacture of cigars and cigarettes, after the methods employed in Cuba, and, with a view of exhibiting those methods to the public, the introduction free of duty of 50 cargoes of Havana tobacco is permitted. These different concessions are made as aids to the development of the industries of the country. — By decree of January 20, 1879, which took effect on October 1, 1879, the export duty on coffee has been reduced from $1 to 50 cents per quintal.

A first line of railroad traversing the republic, from San José, on the Caribbean Sea, to the Pacific, is now (1879) in process of preparation. The grading through the mountain passes between Escuintla and *G.* city will be a formidable undertaking; but the sound financial condition of the country will enable the government to secure an admirable road-bed on the most economical terms, and with the greatest possible despatch. The line is already looked forward to as one of material advantage to American shippers, particularly those sending merchandise from San Francisco, between which port and several ports of Central America there is a brisk and ever-increasing traffic. Indeed, it is affirmed that more than one Californian firm has advanced material for the construction of the road, receiving very liberal terms from the government. With the completion of the *G.* Central Railroad the sea-route between San Francisco and the Atlantic cities of the U. States would be shortened by from 1,500 to 2,000 m., and the additional advantage would be obtained of an extensive local trade which the Panama railway is powerless to favor.— A wagon road, now for a number of years in course of construction, will soon open up the interior to commercial enterprise, and place the Atlantic port of Santo Tomás within seven days of New York. This new facility, added to those of the harbor of Santo Tomás itself, will remove all difficulties hitherto impeding the extension of trade with the Atlantic shore of the republic, no small element of which would be the immediate introduction of American supplies for the mines: for the rich gold-districts watered by the Motagua River, and but two or three days' journey distant from the port, are attracting considerable attention, since the favorable report given of them by an American mining engineer, who surveyed them at the President's request. But trade with the U. States would not be limited to any particular branch. American manufactures of all kinds are in *G.* preferred to European, and the demand for them will increase with increased possibilities of transport.

Finances. The national finances of *G.* are in a very sound condition. For the year 1877 the revenue amounted to $4,503,523, and the expenditure to $4,428,298; leaving a surplus of $75,225. The total amount of the national debt at the end of that year, was $3,877,384.

Banking. The "Internal Bank of *G.*," founded on October 1, 1877, has a capital stock of $600,000. The class of business done includes every line of banking operations, discounts, exchanges, deposits, loans on real estate or collaterals, and the issue of notes. Of these there were in circulation in July, 1879, about $250,000 fully guaranteed. The bank has established relations with the different monetary centres of the world, and furnishes letters of credit, exchange, etc., to the public at reasonable rates. A branch bank has been established in Quezaltenango and another at Caban.

Money, Weights, and Measures. The unit of money is the *Dollar*, or *Piaster*, of 100 *Centavos* = $0.935.

The principal weights and measures are: —

The *Libra*	= 1.014 lbs. avoirdupois.
" *Quintal*	= 101.40 " "
" *Arroba*	= 25.35 " "
" *Fanega*	= 1½ imperial bushel.

The old weights and measures of Spain are in general use.

Guava, the fruit of the *Psidium pyriferum* and *P. pomiferum*, nat. ord. Myrtaceæ, the pulp of which is made into a jelly of a peculiarly delicious flavor. This sweetmeat is imported in considerable quantities from the West Indies.

Imp. duty: Jelly, 50 per cent; marmalade, or paste, 35 per cent.

Guayaquil. See ECUADOR.

Guaymas. See MEXICO.

Guayra [La]. See VENEZUELA.

Guddok, a rustic violin, with three strings, used among the Russian peasantry.

Gudgeon, that part of a horizontal shaft or axle which turns in the collar; an iron pin fixed as a bearing in a beam or wooden shaft. One of the eyes driven into a ship's stern-post, to hang the rudder on.

Guernsey. See JERSEY.

Guiana, the name formerly given to the N.E. portion of S. America, lying between the rivers Orinoco and Amazon; but as about five sixths of this territory have been included within Brazil and Venezuela, the term is now generally applied to the remaining part, comprehending the settlements of Great Britain, Holland, and France.

I. BRITISH GUIANA.

This colony comprises the most westerly portion of the above territory, extending, as claimed by Great Britain, from lat. 0° 40′ to 8° 40′ N., and from lon. 57° to 61° W.; and including the former Dutch settlements of Berbice, Demerara, and Esse-

quibo. It is bounded N. and N E. for nearly 350 m. by the Atlantic; W., Venezuela; S., Brazil; and E., Dutch Guiana, from which it is separated by the river Corentyn. Area about 76,000 sq. m.; of which, however, considerable portions are claimed by Brazil and Venezuela. Population in 1871, exclusive of American aborigines, 193,491 (of which 108,791 were males and 84,700 females), of whom but 1,414 were Europeans by birth; 56,517 were immigrants introduced by government from India, China, and Africa; 7,925 were natives of Madeira and the Cape de Verde Islands; and the rest mixed races. The government is vested in a governor and a "court of policy," consisting, besides that officer and his secretary, of the chief justice, attorney-general, collector of customs, and five unofficial persons selected by the college of electors.

The coast district of *G.* consists of an exceedingly rich alluvial flat, composed of strong blue clay, highly impregnated with marine and vegetable matter, the surface of which is on a level with the high water of the ocean; and when the lands are drained, banked, and cultivated, they consolidate, and become fully a foot lower, rendering necessary unremitting attention to the dams and sluices to keep out the sea. This flat extends from about 20 to 50 m. inward, terminating in a range of sand-hills, varying in height from about 50 to 150 feet. Beyond this the country consists of a high land which stretches out in undulating plains, rising at some places into eminences. Further S. ranges of hills occur, running N. W. and S E., the most elevated, about 1,100 feet, being in lat. 5° N. About 70 m further S., and parallel to the preceding, are the Picaraima Mountains, which, by means of the Concau chain running S. E., are connected with the Sierra Acaray, a densely wooded range forming the S. boundary of Guiana. These successive chains of hills appear to occupy an inconsiderable width, and the plains between them are of great extent.

The climate was formerly very destructive of human life, owing to the pestilential vapors arising from the marshes of the coast, but draining and cultivation have so far altered its character, that it is now deemed one of the healthiest in the W. Indies. The temperature is remarkably uniform; the average heat at Georgetown being, in the shade in summer, 86° F., while in winter it falls only to 82° or 83°. There are usually two wet seasons, a short one in January and February, and a long one commencing with June; but these, under the influence of cultivation, have been greatly altered both as to intensity and duration The trade-winds blow steadily E. and N. E. for about nine months, changing to S. E. and S. in July, August, and September, the unhealthy season.

The vigor and luxuriance of vegetation in *G.* are equalled by few countries in the world. The number of indigenous plants is remarkable; and nearly one half of the surface is covered by large forest trees, many of which furnish excellent timber; others are used for furniture, or afford dye-wood; and not a few are valued for their fruits, chiefly the banana, pineapple, and cacao-nut. As yet only a few places on the coast, and on the banks of the rivers Essequibo, Demerara, Berbice, and Corentyn, have been cultivated. The plantations are commonly ranged in allotments, varying from about 500 to 1,000 acres each. The dwelling-houses, elevated on piles of timber, as a security against inundation, are generally close to the water-side, with a wharf opposite for the convenience of shipping produce. Cotton and coffee have nearly ceased to be cultivated, all the resources of the colony being concentrated upon the production of sugar and rum. Although the rum produced in this colony does not equal in character that of Jamaica, it yet occupies a respectable place in the market. With respect to the cultivation of the sugar-cane, by reason of the lowness of the land and the plan of drainage in use, namely, that known as the open-drain and round-bed method, the system of cultivation remains exactly as in the times of slavery, every part of the operations of culture being performed by manual labor. The timber-trade has, however, increased to a very considerable extent. The total imports for the year 1878 amounted to $11,149,540, and the total exports to $15,245,785.

The commerce of the U. States with British Guiana is slowly but steadily increasing. For the year 1878 the value of exports and imports was as follows: *Exports to the U. States:* Hides and skins, $1,935; brown sugar (37,435,270 lbs.), $2,044,305; molasses (420,371 galls.), $89,012; rum (4,523 galls.), $1,735; others, $4,309; total, $2,141,326. — *Imports from the U States:* Acids (not specified), $15,526; horned cattle, $2,737; horses (165), $24,778; mules (320), $41,038; sheep (1,795), $10,782; breadstuffs, $868,275; candles, $5 252; carriages, $12,968; cordage, $1,051; cotton goods, $32,972; drugs, $8,835; apples, $2,093; glass ware, $3,333; hay, $10,981; ice, $9,197; iron (manuf.), $7,579; boots and shoes, $3,968; leather of all kinds, $12,863; matches, $11,663; mineral oil, $86,870; lard, $14,341; paper, $16,442; perfumery, $3,519; bacon and hams, $28,281, salted beef, $52,133; butter, $7,000; cheese, $24,893; dried and pickled fish, $7,516; lard, $72,613; preserved meat, $5,869; pork, $184,632; potatoes, $13,061; soap, $3,103; tallow, $5,414; tobacco (leaf), $60,894; tobacco (manuf.), $14,236; wood (boards, staves, etc.), $192,709; household furniture, $18,042; others, $34,433; total, $1,924,922.

The ports of the colony deserving of notice are only two, Georgetown and New Amsterdam.

Georgetown, the capital, is situated on the E bank of the Demerara, a short distance from its mouth, in lat. 6° 49′ N., lon. 58° 12′ W. The streets are wide, and traversed by canals. Shops and stores are numerous, and European goods plentiful The wharf can be safely approached only by small craft, on account of the declivity of the bank, and the ebbing of the tide, the rise of which on the coast is from 16 to 24 feet Vessels not drawing more than 14 feet load and discharge their cargoes in the middle of the stream, but those of greater draught cannot enter the river, owing to a bar at its mouth, and must, therefore complete their loading outside The town being the depot of the produce of the countries adjacent to the Essequibo and Demerara, its commerce is considerable. Pop. 36,000.

New Amsterdam lies in lat. 6° 15′ N., lon 57° 21′ W., at the confluence of the river Canjee with the Berbice, near the entrance of the latter into the sea, and about 57 m. E of the Demerara. The coast here is encumbered with shallows, and the harbor, though good, is difficult of access. From this town is exported the produce of the plantations of the rivers Berbice and Corentyn. Vessels drawing 14 feet may sail about 200 m. up the Berbice. Pop. 5,000.

II. Dutch Guiana, or Surinam.

This colony lies between British and French *G.*, being separated from the former on the W by the river Corentyn, and from the latter on the E. by the Maroni: on the N. it has the Atlantic, and on the S Brazil. It lies between lat 1° 30′ and 6° N., lon. 53° 30′ and 57° 30′ W., being about 300 m. in length, from N. to S., and 260 in extreme breadth. Area 59,051 sq m. Pop. 69,329, comprising 6,000 or 7,000 whites, and upwards of 50,000 negroes. In physical geography, climate, productions, etc., it differs but little from British *G.* The principal river is the Surinam, which flows N. through the centre of the territory, and falls into the Atlantic after a course of nearly 300 m. It is navigable for large ships for about 6 m. from its mouth Along the coast and on the banks of the river are many settlements and plantations; and the higher parts of the country are occupied chiefly by the Maroons, the descendants of runaway negroes. The chief productions are sugar, rum, molasses, coffee, cacao, and cotton Its chief trade is with Holland. Its commercial intercourse with the U States is unimportant.

Paramaribo, the capital, chief port, and commercial emporium of the colony, is situated on the W. bank of the Surinam, 18 m. from its mouth, in lat. 5° 40′ N., lon. 55° 25′ W. It is built in the Dutch style, with wooden houses, and wide straight streets planted with orange-trees; pop. 22,500. It maintains an active intercourse with Holland.

III. French Guiana.

This is the smallest and most eastern division of *G* It lies between lat. 2° and 6° N., and lon. 51° 30′ and 54° 30′ W., being bounded N. and N. E. by the Atlantic, E. and S. by Brazil, and W. by Dutch *G.* It is about 250 m in length from N to S., and varies in breadth from 100 to 150 m. Area 27,560 sq. m. Pop., exclusive of aborigines, 24,432. It has a coast-line of 200 m., extending from the Maroni to the Oyapoc. The low alluvial tract along the coast is of great fertility The mountain chains run E. and W., and are almost wholly of granite, but do not attain a great elevation. The country is abundantly watered, and the coast-lands appear to be less unhealthy than in British *G.* The vegetation of *G* is very luxuriant, and the interior is thickly wooded with trees valuable for their timber, fruits, and dye-woods. Medicinal plants, including quassia, gentian, the castor-oil plant, and arnotto, used in coloring cheese, are all abundant. The island of Cayenne, at the mouth of the Oyak, is about 30 m. in circumference, is separated from the continent by a narrow channel, and contains a penal settlement. The roadstead at the mouth of the Oyak, though small, is the best on the coast, having everywhere from 12 to 13 feet of water. The capital, Cayenne, is situated on the N. side of this island, and contains 6,500 inhabitants. The new town is well built, and has good streets; the government house is in the old town The harbor is protected by a fort and several batteries. The colony is divided into two districts, Cayenne and Sinnamary, and 14 communes The government is vested in a governor, a privy council, and a colonial council, composed of 16 members, elected by the colonists. The cultivated lands are estimated to be about one eighth of the whole territory. Besides the staples of British and Dutch *G.*, its productions comprise pepper (including Cayenne, which is so called from the island of that name), cloves, cinnamon, and nutmegs Trade is mostly with France and its colonies, and there is almost no commercial intercourse with the U. States.

Guide, a person who leads, instructs, or directs another in his way, path, or course. — A tool or instrument director.

Guild, a name given anciently to those commercial associations, or fraternities of particular trades, which were common in many of the towns

of England and Scotland, and under other names in all Europe. In their greatest prosperity these companies, more especially in London, became important bodies, in which nearly the whole community was enrolled; each had its distinct common-hall and property, and made by-laws for the regulation of its members.

Guilder, Gulden, or Florin, a silver coin which was current in many of the States of the Zollverein, and was worth about 42 cents, but variable. The gulden of Holland = $0.385.

Guinea, a British gold coin, worth 21 shillings, and so denominated because the gold of which the first specimens were struck in the reign of Charles II. was brought from the coast of Guinea; and for a like reason it originally bore the impression of an elephant. On the introduction of the *sovereign*, first coined in 1817, the old *G.* coinage was gradually superseded, but accounts are still frequently kept in *G.* in England.

Guinea Coast, the name assigned to that part of the W. coast of Africa which commences at Cape Verga, in about lat. 10° N., and terminates with the Cameroon Mountains in the Gulf of Biafra. These are the limits more commonly given to what is called *G.*; by some they are greatly extended, so as to comprise the whole of the Portuguese settlements S. of the equator, under the name of Southern *G.*, while the coast N. of the equator is called Northern *G.* The physical aspect of the country, as might be inferred from the large extent we have under consideration, is very variable, but is characterized everywhere by excessive richness of natural scenery. In the region of Sierra Leone, Cape Mount, and Cape Mesurado the eye rests on bold headlands and high promontories covered with the richest tropical verdure. In the vicinity of Cape Palmas there are extended plains, slightly undulating, and covered with almost every variety of the palm and palmetto. On the coast of Drewiss the country rises into tablelands of vast extent, and apparently of great fertility. The Gold Coast presents every variety of hill and dale; and as we approach the equatorial region we are saluted by mountain scenery of unrivalled beauty and surpassing magnificence. There are no large or extended political organizations in *G.*, with the exception, perhaps, of the kingdoms of Ashanti and Dahomey, and neither of these has a greater extent of territory than the smaller states of Europe. For the most part, the people live together in independent communities, of not more than 8 or 10 villages, and with an aggregate population of from 2,000 to 25,000. In these different communities they have no written forms of law, but are generally governed by certain traditional usages that have been handed down from generation to generation. Nominally, monarchy is the only form of government acknowledged among them; but, when closely scrutinized, their systems show much more of the popular and patriarchal than of the monarchical element.

Respecting the natural products and trading capabilities of the country, the articles exported consist chiefly of ginger, gum, Guinea grains, palm-oil, ivory, a dyeing wood called camwood, and gold dust. Vessels visiting that coast take on board — at Sierra Leone, or on the coast of Malagueta, between Cape Mesurado and Cape Palmas — some black sailors, called krumen, who are of great use in doing the heavy work on board, and for boat service; thus saving the European seamen from exposing themselves too much to the sun's rays, etc. The services of these krumen are recompensed with two or three pieces of cotton cloth per month each. Their chief food is rice, which may be purchased at a very cheap rate on the coast of Malagueta; the price of a *kru* (a measure of capacity weighing about 30 lbs.), being a fathom and a half of cotton cloth, or any other article of proportionate value. On the coast of Malagueta (Grain Coast), the articles received principally in barter are rice and millet; also ivory, palm-oil, and camwood, especially at Monrovia, the capital of Liberia. At Sierra Leone the pepper-tree (called malagueta) is cultivated on an extensive scale, and its fruit, — Guinea pepper, — after being dried, is purchased in large quantities by the Americans, and imported into the U. States. English muskets, gunpowder, rum, and tobacco are the principal articles of traffic on the whole of the coast as far as Onim, at the bottom of the Bight of Benin.

The principal European settlements, as the British on the Gambia, and the French on the Gaboon, consist of fortified depots at the mouths of rivers, from whence the merchants set out in boats at certain seasons, and ascend the streams as far as they are navigable; stopping at fixed stations to which the natives bring their productions to exchange for manufactures. In a few positions there are besides block-houses, wherein some black soldiers with European officers are kept for the protection of trade. Enterprise, however, is checked both by the savage habits of the natives and by the climate, which along the whole coast is highly insalubrious to European constitutions, and on the shores of *G.* is pestilential to a degree quite unknown in any other part of the world. — Besides the intercourse at the European settlements, there is a considerable floating traffic by vessels which trade along the coast, or enter some of the large rivers, where their cargoes are bartered for produce. This trade, which is of course the only kind carried on in the Gulf of *G.*, between the Gold Coast and Angola, a tract where there are no European settlements, and which includes the fertile and populous countries watered by the embouchures of the Quorra and other large rivers, appears to be nearly as extensive as that conducted at the European settlements.

Guinea-Corn, a name in the West Indies for several species of *Panicum*, including *P. pyramidale*, *scabrum*, and *tenellum*, cultivated for their seeds.

Guinea-Fowl, the *Numida meleagris*, a bird wild in the West Indies, but now domesticated in our poultry yards. The flesh is considered by many persons to equal that of the pheasant.

Guinea-Grains. See Grains of Paradise.

Guinea-Grass, Guinea-Pepper, a tall, strong forage grass, the *Panicum maximum* of Jaquin; naturalized in the West Indies and our Southern States, having been introduced from the W. coast of Africa.

Guinea-Pig, a small tailless quadruped, the *Cavia cobaya*, a native of S. America, which is often domesticated, and kept as a pet.

Guipure, an imitation of antique lace, which is durable, less expensive, and equally beautiful. It is made by cutting out the pattern from cambric, the flowers and heavy parts being made of the cambric, and the open parts of stitches closely resembling the antique lace. In France, a guipure lace, much resembling the Honiton, is made, which is very fine and white, and of a moderate price; a kind of gimp.

Guitar, a musical stringed instrument, larger than the violin, and played with the fingers. The modern Spanish *G.* has six strings, three being of silk, covered with silver wire, and three of catgut.

Gulden. See Guilder.

Gulf of Mexico, a large indentation on the E. coast of N. America, washing the shores of the U. States and Mexico, measuring about 1,000 m. from E. to W., and 800 m. from N. to S.; estimated area, 800,000 sq. m. It is partly formed by the projection toward each other of the peninsulas of Florida and Yucatan, nearly in a line between which lies the island of Cuba, leaving a communication on its N. with the Atlantic, through the Florida Channel, and on its S. with the Caribbean Sea, through the Channel of Yucatan. The Gulf is free from banks, and contains only a few small rocky islands on the coast of Yucatan, with the Florida Reef near its E. extremity. The shores are low, and generally lined with flat sandy islands, not far from the land, and numerous lagoons. There are few harbors; and the rivers which fall into it are obstructed by bars at their mouth, which render them all, except the Mississippi, nearly inacces-

sible for vessels of large draught. A current of water entering the Gulf from the Caribbean Sea is soon divided into two portions, the one running E. along the coast of Cuba, the other W., in a curved line through the middle of the Gulf, round towards the Florida Channel, where it meets the other current, and the two united form the Gulf Stream. The temperature of the Gulf of Mexico is 86° in summer, and 6° higher than that of the ocean in the same parallel. The depth of the marine basin which holds the waters of the *G.* is, in its deepest part, about three quarters of a mile. At high tide the Pacific rises several feet above the level of the Gulf, and at low water it falls as far below it. The most remarkable phenomenon connected with this Gulf is the Gulf Stream, which enters it by the channel of Yucatan, passes around it, and flows out by the Florida channel.

Gulf, Western Texas, and Pacific R.R. runs from Indianola to Cuero, Tex., 66.8 m. This Co., whose offices are in Cuero, is in part formed of the old San Antonio and Gulf R.R., between Port Lavacca and Indianola. In 1877 the road was sold, subject to a mortgage debt of $1,200,000, for $100,000 and reorganized. *Financial statement:* Cap. stock, $500,000; cost of construction (to March 31, 1879), $1,919,727.08.

Gullet, the lower end of the horse-collar, around which pass the *chok-straps*, and the *breast-straps* which support the pole of a carriage.

Gullet-Saw, Brier-Tooth Saw, a saw that has a hollow cut away in front of each tooth in continuation of the face and on alternate sides of the blade.

Gulley, Gully, the tram-plates or rails laid for the use of tram-wagons.

Gum. Under this term are included several modifications of a distinct proximate principle of vegetables. To some of these the term *mucilage* is occasionally applied; and all the varieties may be referred to one or other of these species, — *G.* arabic furnishing a characteristic specimen of *G.*, and tragacanth of mucilage. In commerce the term *G.* is often incorrectly applied to the resins and gum-resins. *G.* is a thick, transparent fluid, that issues spontaneously from certain species of plants, particularly such as produce stone-fruit, as plum and cherry trees. It is very adhesive, and gradually hardens by exposure to the atmosphere. It is usually obtained in small pieces, like tears, moderately hard and somewhat brittle while cold; so that it can be reduced by pounding to a fine powder. When pure, it is colorless; but it has commonly a yellowish tinge; it is not destitute of lustre; it has no smell; its taste is insipid; its specific gravity varies from 1.3161 to 1.4317; it readily dissolves in water, but is insoluble in alcohol. *G.* is extensively used in the arts, particularly in calico-printing, to give consistence to the colors, and to hinder them from spreading. It is also used in painting, in the manufacture of ink, in medicine, etc. The only important gums in a commercial point of view are *G.* arabic, *G.* senegal, and *G.* tragacanth; but lac is popularly, though improperly, ranked among the gums. The term *G.* has likewise been applied to several artificial products, the chief of which is British *G. Imp.* free.

Gum Ammoniac. See AMMONIACUM.

Gum Arabic [Arab. *tolh;* Fr *gomme Arabique;* Ger. *Arabische Gummi;* It. *gomma Arabica*], the produce of several species of trees of the genus *acacia*, growing in Arabia and in many parts of Africa. The best or true white *G.* is yielded by *Acacia verek*, the red *G. A.* by *Acacia adansonii*. *Acacia vera* also yields *G. A.* and a part of the Senegal *G.* The *G.* exudes naturally from the trunk and branches, and hardens by exposure to the air in irregularly shaped pieces, hard, brittle, and semi-transparent. When pure it is almost colorless, or of a pale yellowish hue, being insipid, inodorous, and dissolving completely in the mouth. Sp. gr. 1 31 to 1 43 It is often mixed with *G.* senegal. East India *G. A.* is, though a useful, a spurious article, not being the produce of the *Acacia vera*, but of other species of plants. The best *G.* is either imported direct from Alexandria, Smyrna, Tripoli, Mogadore, Tangiers, etc, or at second-hand from them through Gibraltar, Malta, and other Italian ports The price depends principally on its whiteness and solubility, increasing and diminishing from $8.75 to $40 or $45 per cwt, according as the article has more or less of these qualities. — *Test.* Powdered *G. A.* is frequently adulterated with flour or farina, or with Senegal or other inferior *G.* The first may be detected by agitating a little of the powder with cold water; the pure *G.* dissolves rapidly, whilst the starch or flour falls to the bottom of the vessel. Or, a little of the powder may be mixed with boiling water, and when cold, tested with tincture of iodine; if it contains starch or flour, the paste will assume a blue color. If it contains cherry-tree *G.* or tragacanth, it will be only partly soluble in cold water, and the paste will be partly colored, and more or less interspersed with gelatinous clots. Much of the white *G. A.* of commerce is formed by bleaching *G.* senegal by what is called "Picciotto's process." The *G.* is dissolved in water and sulphurous acid gas passed through the solution. The liquid is afterwards boiled to expel the sulphurous acid, a little of which, however, still remains behind. To obtain the *G.* in a still whiter state, carbonate of baryta is added, and after agitation the mixture is filtered; it is afterwards shaken with gelatinous alumina, again filtered, and evaporated The product (*bleached G.*) is very white, but lacks the peculiar toughness and adhesiveness of the best *G. A.*

British G. See DEXTRIN.

Gum Senegal. This product, which is largely exported from Portendie, Sierra Leone, and the French settlements on the Senegal, ranks next in quality to *G.* arabic, and for many purposes, as calico-printing, for instance, it answers equally well. The transparent and light-colored pieces are frequently picked out and sold as *G.* arabic.

Gum Tragacanth, Gum Dragon, is the gummy exudation of the *Astragalus verus*, hardened by the air. When digested in water, it swells considerably, a portion is dissolved, and the whole combines to form a thick mucilage. It is totally soluble in boiling water, when some change is supposed to take place in it; a great portion, however, afterwards separates. Sp. gr. 1.384. It is chiefly employed in calico-printing, and by shoemakers and lozenge-makers; by the latter to give toughness to the saccharine mass. — *Test.* Powdered *T.* is often adulterated with flour of starch, and not unfrequently with the commoner varieties of *G.* arabic A mixture of pulverized *T.* and *G.* arabic forms, with water, a thinner mucilage than the same quantity of either of these *G.* alone. This fraud may be detected as follows: Make a mucilage of the suspected *G.*, and add thereto a few drops (2 or 3 to the dr.) of alcoholic tincture of guaiacum, taking care to stir it all the while. If the sample contains any *G.* arabic, the mixture, in the course of a few minutes, assumes a fine blue color, whilst it does not change color if the *G. T.* is pure; 5 per cent of *G.* arabic can be thus detected. When the quantity is very small, one to four hours may elapse before the color is developed. Starch and flour are detected in the manner noticed under *G.* arabic.

Gum-Elastic. See INDIA-RUBBER.

Gum Juniper, a concrete gum-resin obtained from the *Juniperus communis*.

Gum-Lac. See LAC.

Gummer, a tool or machine for deepening and enlarging the interdental spaces of worn saws.

Gumming, the treatment of a lithographic stone with a solution of gum arabic, after, or simultaneously with, the etching process, whereby the clean parts of the stone devoid of work are protected from receiving fatty matter, and thus reject the greasy ink when the roller passes over the stone. The clean surface of the stone is damped between each impression, but, without the gumming, it would not permanently resist the ink. — *E. H. Knight.*

Gum-Resin. The resins, as they exude from trees, are often mixed with gum, when they form *gum-resins.* These substances are in their properties intermediate to resins and gum, and are not therefore to be considered distinct vegetable principles. They are not entirely soluble in water or in alcohol, but proof spirit dissolves the greater part of them. They also readily dissolve in alkaline solutions when assisted by heat; and the acids act

upon them nearly as upon the resins. To this class belong *ammoniacum, gamboge, assafœtida, olibanum, aloes, myrrh, opium,* and others.

Gum-Wood, the wood of a species of *Encalyptus* obtained in Australia, shipped in logs and planks to England. It is used in ship-building and joinery.

Gun, a general name for explosive instruments of different sizes, consisting of a barrel of strong metal fixed in a stock or mounted on carriages. The heavy descriptions of guns, called cannon, ordnance, field-pieces, swivels, carronades, howitzers, mitrailleurs, and mortars, are described under those several heads. They usually take their distinguishing name from the weight of the ball that will fit them. The smaller and portable kinds of guns are named muskets, rifles, carbines, fowling-pieces, revolvers, etc. This article is devoted to the breech-loading small arms which are the most generally in use at the present time.

American invention and genius have been largely directed towards the production of a simple form of breech-loading small arm. Prior to 1860 there had been less than 200 patents taken out for this purpose; from 1860 to 1880 this had increased to the large number of over 800, — more than quadruple the inventions of all the rest of the world in the same direction. It may be as well to remark here that, with the single exception of the needle-gun, every arm on a breech-loading system used in Europe is of American origin, both in its principle and application; a large portion being of American manufacture. Thus, in Great Britain, the Snider, largely adopted, is an American invention, and the Martini-Henry is acknowledged to be an infringement of an American patent. Russia, Sweden, Holland, Spain, Egypt, Greece, Turkey, and Switzerland are all using American arms; and even the Prussian needle-gun and the French chassepot bid fair to be supplanted.

Remington Breech-loading Rifle. This American arm made its first public appearance before a board of U. States army officers convened at Springfield, Mass., in January, 1865. It was perfected in the following year, as now in use by so many nations of both hemispheres. It has an incontestable superiority to any other system, both as regards precision and strength. The mechanical characteristics of this gun are its simplicity, manifest in the small number of parts and their direct action; and its solidity and strength, due to the extraordinary size of parts, and the relation of each part to its fellows and to the whole action. At the moment of discharge the breech-piece is supported by the front part of the hammer, which forms a shoulder to receive the recoil, and the entire strain upon the axis of the breech-piece comes on that part in the rear of the forward pin, as has been demonstrated by experiments, in which the arm has been successfully fired after having the front portion of the axis of its breech-piece removed by filing. The mechanical construction of the breech-system of the Remington arm is plainly shown in Fig. 252 the upper diagram (1) exhibiting the system with breech-block and hammer closed, and the other (2) with those parts open in position for loading. The constituent parts of the action are the breech-block (B) and the pin (C); main-spring (*a*) and screw; trigger, (*c*) trigger-spring (*e*), and screw; locking-lever (*d*), locking-lever spring (D), and screw; firing-pin (H) and screw. The extractor, not indicated by a letter, is seen in diagram 2, engaging in a slot in the shoulder of the breech-block. The breech-block and hammer are solid pieces of fine steel, $\frac{69}{100}$ of an inch thick, pivoted upon pins of the same material $\frac{46}{100}$ in diameter. These pins pass entirely through the sides of the frame, and are held in place by the button screwed on to its left exterior side. The main-spring, trigger-spring, locking-lever, and locking-lever spring are all of steel, the springs having the simplest possible curves, and the action of the main-spring upon the hammer being direct. The function of the locking-lever is twofold, one of its offices being to lock the trigger, so that it cannot escape from its notch in the tumbler when the breech-block is opened, and a second to secure the breech-block when closed by the force, directly transmitted, of the lever-spring (D). It should be remarked that the whole of the lock-work, with the exception of the hammer, is attached to the guard-strap, which is thus by a very ingenious construction made to subserve the double purpose of guard-strap and

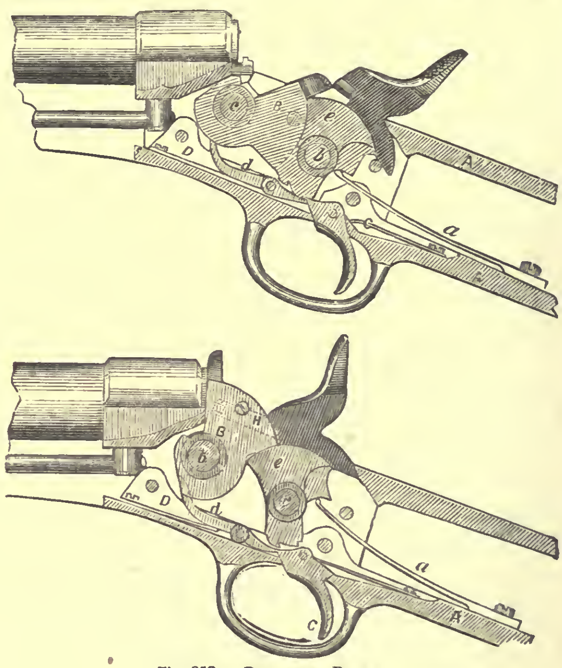

Fig. 252. — Remington Rifle.

lock-plate. The extractor works in a recess cut in the left interior of the chamber, and is operated by means of a projection on its lower face, which engages with the shoulder of the breech-block, so that the act of swinging back the block withdraws the empty cartridge-case by an entirely positive motion, independent of spring or indirect agent, — a mode of extraction distinguished for its simplicity, smoothness, and certainty of operation. The firing-pin works through the breech-block, as indicated by the dotted lines at H. It is forced against the primer by the sudden shock of the hammer, which is imparted through the direct action of the strong and very slightly curved main-spring, so that a miss-fire is impossible with cartridges made and fitted to the chamber. The operation of this arm is especially simple. To load the piece the hammer is first brought to full cock, and the breech-piece swung back by pressing the thumb-piece with the thumb of the right hand. The backward motion of the breech-block withdraws the discharged shell from the chamber, and if this motion is executed quickly, with the muzzle of the arm slightly elevated, the case will fall out without necessitating the use of the fingers. The fresh cartridge is then inserted, and the breech closed in the continuous motion. The arm is then ready to fire, and after very little practice a soldier can get 17 shots per minute. The fire-arms manufactory at Ilion, in Herkimer County, was originated in 1825 by Mr. Eliphalet Remington, who died in 1861. In 1864 the private firm, still including only the sons of the founder, was made into a company incorporated under the name of E. Remington and Sons. The entire stock of the company, valued at about $3,000,000, is owned by the Remington family.

Ward-Burton Breech-loading Rifle, originally the invention of Mr. Bethel Burton, of Brooklyn, N. Y., has been since greatly developed and improved by Brig.-Gen. W. G. Ward. It is constructed on the bolt, or needle-gun, system, but its principles differ essentially from those of any other arm on the bolt system. It is operated by holding the piece in the left hand below the lower band, in the position known in the manual for muzzle-loading arms as *prime*, and seizing the handle of the breech with the right hand, nails uppermost. The breech is then opened by turning the handle up and with-

drawing it to its full extent of motion, a cartridge taken from the pouch with the right hand and dropped bullet-end to the front in the now open receiver, and the breech closed by reversing the motions required to open it. By the motion of opening the breech to reload, the empty cartridge-shell will be ejected. The breech, however, may be closed during the act of raising the gun to the position of aim. A manual to load and fire by command in six motions may thus be readily devised. Practically, to load and fire requires but four motions. The piece, altogether, consists of 15 pieces, which, with some addition to its cost, might be reduced to 11 pieces. This rifle has been submitted to the severest tests of rusting, has been filled with sand and dirt, and thoroughly tried with defective cartridges, without in the least affecting its perfect working. The machinery required for the manufacturing of the breech mechanism is simple, and cheaper, it is claimed, than any other known; in fact, the parts can be made with ease in any shop having a lathe and scraper. This rifle was satisfactorily tested before the New York State Board in 1867; Massachusetts State Board in 1868; the Naval Board in 1869; and in April, 1870, before the Army Board in session at St. Louis, Mo.

Peabody Breech-loading Rifle. The record of this arm entitles it to rank among the best productions of American industry. The inventor, Mr. Henry O. Peabody, of Boston, an active and thoughtful mechanic, had his attention first directed to the subject of breech-loading arms at the commencement of the civil war. After careful labor and study he worked out the original idea of the mechanism of the Peabody gun, which is today as he made it, unimproved and unchanged, the first and only patent in the U. States, having been taken out July 22, 1862. This gun has a falling breech-block, hinged at the rear and depressed by the guard-lever, whose short arm engages in a recess of the block and controls its movements. When the block is down the cartridge is slipped into the bore, and the piece is fired by the fall of the hammer upon a firing-pin sliding in a groove in the side of the block. In opening to reload the block drops upon an elbow-lever, and withdraws the spent cartridge-shell. The Peabody arm has been, since its origin, manufactured and controlled by the Providence Tool Company, of Rhode Island, who have a capacity sufficient to turn out 10,000 guns per month.

Whitney Breech-loading Rifle. Great improvements in the machinery for the manufacture of small arms are due to Eli Whitney, the celebrated inventor of the cotton-gin. His establishment for this purpose was originally started in 1798, thus making him the pioneer in this line of manufacture. He was the first to invent and develop the system known as the American or interchangeable system, carried out by the use of hardened jigs or forms of the same shape as the part to be produced, thereby turning out every piece for each particular part of the same form and dimensions. He also introduced the use of milling, by means of revolving cutters, those irregular and intricate forms necessary to be produced in making a gun. The Springfield armory was established in 1800, and the system invented by Mr. Whitney was put in force there, and has been in use in all government works ever since. The English War Department was forced to adopt the same system, and put it to practical use in 1855 by importing a large amount of American machinery. Since that date other governments have adopted the same general system, which is made specially necessary in the proper manufacture of breech-loading small arms. The admirable series of inventions used in this system remains now, like the cotton-gin, the same as when first invented, no practical change having taken place in 80 years, notwithstanding the inventive genius which has been at work during that period of time. No patents have ever been taken out for the Whitney inventions, but they have been freely given to the public, and have saved the U. States government large sums of money by lessening the cost and perfecting the manufacture and repairs of fire-arms. The Whitneyville Armory, property of the Whitney Arms Co., is now one of the largest in the U. States. It is located near New Haven, Conn., and is now under the control of the son and grandson of the founder, who have added many valuable improvements. The system of breech-loading small arms, now known as the Whitney system, has its foundation in the invention of Col. T. T. S. Laidley, of the U. States Ordnance Bureau, and was first patented in the U. States in 1866. The claims made for this arm, as remodelled and improved by the present owners, are very strong, the most prominent being as follows: The arm loads on the half cock, the breech is securely locked the instant it is closed, thereby preventing the possibility of the charge flying back and injuring the person firing. When loaded, and the hammer on the safety notch, the arm cannot be discharged by any violent concussion or by the accidental pulling of the trigger. The breech-block and locking-shoulder, made of the best steel, are of such form and dimension, and are so firmly supported by solid steel pins passing through the iron frame, that the strength of the system in resisting the recoil of the charge is claimed to be equal, if not superior, to any other. There are no delicate springs or pins liable to be constantly breaking. The parts are very few as compared with other systems, and they are all simple in purpose and construction. The motions in operating the system are short and natural, and are performed with one hand. They are so simple that the common soldier needs little or no instruction, and accident from ignorance of the position of the parts is impossible. The throwing up of the breech-block pushes the cartridge into the chamber, so that the fingers need not to be brought in contact with the barrel when hot. The hammer being entirely independent of the locking-shoulder, it can be brought to full cock without unlocking the breech. The cartridge shell is thrown from the barrel automatically on opening the breech to receive a new charge. The barrel can be cleaned from either end without dismounting any of the parts, and the arm dismounted and reassembled with the greatest ease by a person not a mechanic.

Other well-known forms of American breech-loading guns are the *Springfield*, the *Joslyn-Tomes*, the *Berdan*, the *Earnest*, the *Colt*, the *Milbank*, the *Spencer*, the *Roberts* the *Ball-Lamson*, the *Broughton*, etc.

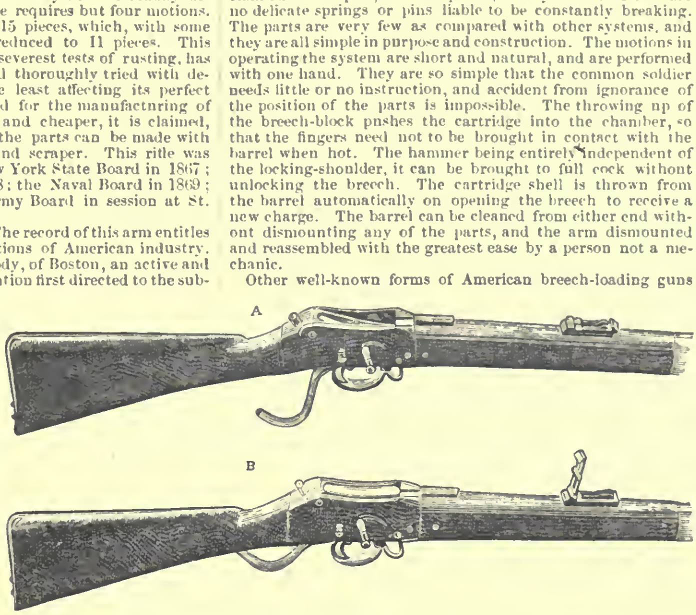

Fig. 253. — The Martini-Henry Rifle.
A, ready for loading; B, loaded and ready for firing.

Martini-Henry Breech-loading Rifle. This arm, lately adopted by the British government to replace the "Snider," or "Converted Enfield," is a combination of Henry's system of rifling with Martini's mechanism for breech-loading, which last is a manifest infringement on the American Peabody patent. The breech-block is pivoted at its upper rear portion, being moved up and down by a lever at the rear of the trigger-guard. The firing is by a spiral spring, which actuates a firing-pin. The cartridge-shell extractor works on a pivot below and behind the barrel being operated by the descent of the front end of the breech-block upon one arm of the bell-crank lever. A competent military authority, after instituting a careful comparison between the breech-loading small arms of Germany, France, and England, concludes that in the Martini-Henry the English have a weapon "giving great accuracy at long ranges, combined with a very flat trajectory, and therefore fearfully destructive at short ranges, with terrible smashing power and great penetration, not liable to fouling, easily cleaned, and not injured by being left uncleaned, with grooves which do not lead or wear out; a breech mechanism easily constructed by machinery, easily worked, not liable to get out of order, utterly unaffected by rust or dirt, wearing well, quickly loaded, light, handy, strong, and durable." As an evidence of the accuracy of fire in this rifle, it is said that of 20 shots fired at 1,200 yards, the mean absolute deflection of the hits from the centre of the group was 2.28 feet. The highest point in the trajectory at 500 yards is rather over 8 feet, so that the bullet would not pass over a cavalry soldier's head within that distance. The trajectory of the Snider at the same range rises to nearly 12 feet. The bullet will pass through from 13 to 14 ½-inch elm planks placed 1 inch apart at 20 yards distance; the number pierced by the Snider under similar circumstances being from 7 to 9. As regards rapidity of fire, 20 rounds are said to have been fired in 53 seconds; and one arm which had been exposed to rain and water artificially applied for seven days and nights, and had during that time fired 400 rounds, was then fired, without cleaning, 20 rounds in 1 minute 3 seconds.

Chassepot Breech-loading Rifle, the weapon of the French infantry. This arm has a rifled barrel, with a breech mechanism of great simplicity, which is represented in section in Fig. 254. The piece marked B corresponds to what is called the

"hammer" in the old lock used with percussion-caps, and the first operation in charging the rifle consists in drawing out B, as shown in the cut, until, by the spring, C, connected with the trigger, A, falling into a notch, the hammer, if we may so term it, is retained in that position. The effect of this movement is to draw out also a small rod attached to the hammer, and terminated in front by a needle, about ½ in. long, at the same time that a spiral spring surrounding the rod is compressed, the spring being fastened to the front end of the rod, and abutting against a screw-plug, which closes the hinder end of F, and permits only the rod to pass through it. The piece F, which is also movable, has projecting from its front end a little hollow cylinder, through the centre of which the needle passes, and this little cylinder has a collar, serving to retain its position, an india-rubber ring surrounding a portion of the cylinder, and forming a plug to effectually close the rear end of the barrel. It will be noticed that the cylinder is continued by a smaller projection, which forms a sheath for the point of the needle. The movable breech-piece, F, is provided with a short lever, E, by which it is worked. The second movement performed by the person who is charging the piece is to turn this lever from a horizontal to a vertical position, which thus

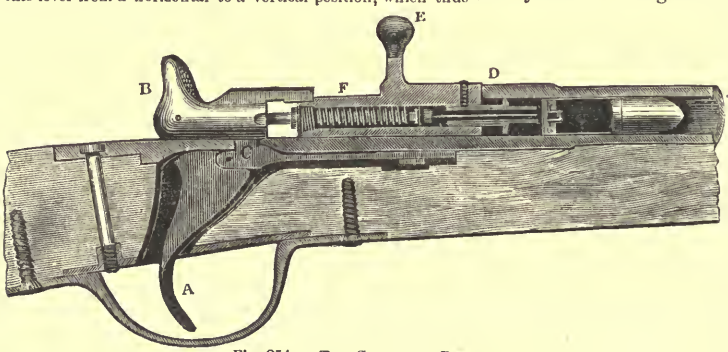

Fig. 254. — The Chassepot Rifle
(Section of the breech)

causes the piece F to turn 90° about its axis, and then by drawing the lever towards him he removes the piece F from the end of the barrel, which, thus exposed, is ready to receive the cartridge. The cartridge contains the powder and the bullet in one case, the posterior portion containing also a charge of *fulminate* in the centre, and it is by the needle penetrating the case of the cartridge and detonating this fulminate that the charge is exploded. When the cartridge has been placed in the barrel, the piece F is pushed forward, the metallic collar and india-rubber ring stop up the rear of the barrel, and on turning the lever, E, into a horizontal position, the breech is entirely closed. If now the trigger be drawn, the hammer is released, and the spring carries it forward, at the same time impelling the needle through the base of the cartridge-case, where it immediately causes the explosion of the fulminate. The bullet is conical, and its base having a slight enlargement, the latter moulds itself to the grooves with which the barrel is rifled. The chassepot has an effective range of 1,093 yards, and the projectile leaves the piece with a velocity of 1,345 ft. per second, the trajectory being such that at 230 yards the bullet is only 18 in. above the straight line. The piece can be charged and fired by a soldier in any position, and it was found that it could be discharged from 7 to 10 times per minute, even when aim was taken through the sights with which it is furnished, and 14 or 15 times per minute without sighting.

The *Needle-Gun* is the Prussian arm of which we heard so much during the last wars against Austria and France. The fundamental principle of the needle-gun lies in this: that a cartridge is employed which contains within itself the fulminating compound that is to ignite the powder; and since this fulminate lies buried between the powder and the bullet, it can only be reached and struck, and hence ignited, by a needle piercing the cartridge. First, beginning with the feature most prominent, is the *needle*, fixed in a holder or bolt encircled by a spiral spring, the recoil of which is to dart the needle into the explosive charge; second, the *lock*, or appliance for drawing the needle back to put into connection with the trigger; third, the *chamber*, which forms the breech-piece, and which carries a little tube, or guide, through which the needle passes to the cartridge. The whole of this mechanism is carried in a cylindrical case, which is fixed to the stock by bands, and into which the barrel is screwed, so that the case forms, as it were, a prolongation of the barrel. Lastly, there is the *trigger*, which, when pulled, discharges the needle from its detaining catch. The advantages claimed for the needle-gun are chiefly these: that the bullet is propelled through rifled grooves without violent forcing into the barrel, — indeed, without coming into contact with it; that the loading is simple and rapid, the ball, powder, and cap being contained in the cartridge; that the loading is from the breech; that the combustion of the powder and cartridge-case is more complete than in any other guns; that the escaping gas carries but little smoke with it; that the gun is instantly disabled, if necessary. Some of these advantages are, of course, common to most breech-loaders; but there is one especial merit in the needle-gun which is not so common to other constructions, and that is the ease with which the mechanism can be made and put together. Notwithstanding the many advantages claimed by the needle-gun, the many rifle-trials in the U. States, in Great Britain, and other countries, show that the various governments, and military men generally, have not recognized the superiority of the needle-gun, which, in fact, is already partially discarded by the German government, as is the chassepot by the French

Gatling Gun. See Mitrailleur.

Gun-Barrel, the metallic tube of a gun.

Gun-Boat, a small vessel formerly fitted to carry one or two guns at the bow; but they are now very differently constructed.

Gun-Carriage, the framework or movable support for a piece of ordnance.

Gun-Case, the box or receptacle for a rifle or fowling-piece.

Gun-Cotton, Pyroxylin, an explosive preparation which, as a substitute for gunpowder, has undergone a large amount of experiment and inquiry on the part of chemists. The best method to prepare it is in mixing 89 parts by weight of nitric acid, sp. gr. 1 424, with 104 parts by weight of sulphuric acid, sp. gr. 1.833. When the mixture has cooled down to between 50° and 60° F., clean rough cotton, in as open a state as possible, is immersed in the acid; when well soaked the excess of acid is drawn or poured off, and the cotton pressed lightly in order to separate the principal portion of the acid. The cotton is then covered over and left for half an hour, when it is pressed and thoroughly washed in running water to get rid of the free acid. After being partially dried by pressure it is washed in an alkaline solution made by dissolving 1 oz. of carbonate of potash in a gallon of water. The free acid being thus got rid of, it is put into a press, the excess of alkaline solution is expelled, and the cotton left nearly dry. It is then washed in a solution of pure nitrate of potash, 1 oz. to the gallon, and being again pressed, is dried at a temperature of from 150° to 170°. *G.-C.*, compared with common cotton, is heavier, harsher, more electric, more soluble in ether. When dissolved in ether it forms *collodion*, so much used in photography. It explodes violently at 350° to 400° F., — much more rapidly, indeed, than gunpowder, having thrice the force. Hence the supposition that *G.-C.* would be a valuable substitute for gunpowder as an explosive agent, for artillery purposes, sporting, blasting, and pyrotechny. A great drawback to the realization of this hope is the danger attending the use of the substance, due to the temperature at which it explodes, and the violence of the explosion. The making of it is very perilous, having led to several frightful calamities. Artillerymen, too, object to its suddenness of action; for the explosive force expends itself before the ball or bullet is prepared to receive the full effect. This is quite consistent with the results of experiments on gunpowder, by

which it is known that the powder may be too violent and sudden in its action for artillery purposes. *G.-C.* has another defect: it absorbs humidity very rapidly, and cannot be used till redried.

Import duty same as gunpowder.

Gunda, the sum of 4 cowry shells used by the poorer natives of India as a medium of currency in smaller or fractional payments and purchases.

Gun-Flint, a sharpened flint for a firelock: since the introduction of percussion-caps to rifles and pistols, flintlocks are now seldom used, except among a few barbarous tribes.

Gunjah, a name for the dried hemp-plant, which is cut after flowering, and formed into bundles from 2 to 4 feet long by 3 inches in diameter. The resinous substance contained in the plant is narcotic, causing intoxication. *G.* is chiefly sold for smoking with tobacco, and is used in Hindostan, Persia, and other parts of the East.

Gunlock, an apparatus for igniting the charge, which has advanced in improvement by several stages. In the earliest muskets a slow-match was applied by hand to the powder in the touch-hole. In the *matchlock* the match was brought down by a trigger and lever upon the touch-hole. In the *wheel-lock* a rotating steel wheel, coming in contact with a piece of flint, struck sparks, which kindled the powder in the touch-hole. In the *flint lock* the contact of flint and steel produced a spark in a more convenient way than in the wheel-lock. The flintlock is now superseded by the *percussion-lock*, in which a hammer gives a smart blow to a small *percussion-cap*, explodes some composition contained in it (see PERCUSSION CAP), and kindles the powder through a small hole in the nipple on which the cap is placed. All the famous rifles of the present day have locks peculiar to themselves. See GUN.

Gun-Metal, an alloy containing 90.5 per cent of copper and 9.5 per cent of tin, used for casting pieces of ordnance (erroneously termed "brass guns"), also those parts of machinery which are subjected to considerable friction.

Gunnery, the science of constructing and using large and small fire-arms.

Gunning-Punt, a low, flat-bottomed boat, used for shooting wild-fowl from.

Gunny, Gunny-Bag, Gunny-Cloth, a coarse strong sacking made in India, and much used for bags and bales for wrapping cotton, rice, spices, and other dry goods. In Bengal gunny-cloth is made of jute, the produce of species of *Corchorus*, and is exported made up into bags, or in pieces, each large enough for one bale. The gunny-bags of Bombay and Madras are, however, made up of different kinds of sunn fibre, the *Crotolaria juncea*. Considerable quantities are yearly imported into the U. States, chiefly for baling cotton.

Imp. duty; not cotton bagging, valued at not over 10 cts per sq. yd., 3 cts. per lb.; valued over 10 cts. per sq. yd., 4 cts. per lb. — Suitable for same use as cotton bagging, valued at not over 7 cts. per sq. yd., 2 cts. per lb.; valued over 7 cts. per sq yd., 3 cts. per lb. — Old or refuse, fit only to be remanufactured, free.

Gunpowder [Fr. *poudre*; Ger. *Pulver*, *Schiesspulver*; It. *polvere*; Sp. and Port. *polvora*], a well-known inflammable powder, is composed of nitre, sulphur, and charcoal, reduced to powder, and mixed intimately with each other. The proportion of the ingredients varies very considerably; but good *G.* may be composed of the following proportions: viz. 76 parts of nitre, 15 of charcoal, and 9 of sulphur. These ingredients are first reduced to a fine powder separately, then mixed intimately, and formed into a thick paste with water. After this has dried a little, it is placed upon a kind of sieve full of holes, through which it is forced. By this process it is divided into grains, the size of which depends upon the size of the holes through which they have been squeezed. The powder, when dry, is put into barrels, which are made to turn round on their axes. By this motion the grains of *G.* rub against each other, their asperities are worn off, and their surfaces are made smooth. The powder is then said to be glazed. The great explosive power of *G.* renders its manufacture a dangerous one. Every precaution is taken in *G.* mills and in magazines, to avoid the use of artificial lights, and to guard against the production of sparks from metals, etc. In "sporting powders" the proportion of saltpetre is generally from 1 to 3 % greater than in the government powders. In "miners' powders" it is about 10 % less, an excess of sulphur being used. The following are the proportions adopted by the principal powers: —

	Saltpetre.	Charcoal.	Sulphur.
U. States	75	14	10
	76	15	10
England	75	15	10
France	75	12.5	12.5
Austria	75	15	10
Germany	75	13.5	11.5
Russia	73.78	13.59	12.63
Spain	76.47	10.78	12.75
Sweden	76	15	9

The quality of *G.* is best estimated by actual trial of its power and cleanliness in use. It should be dry, hard, and free from dust; the grains should be of a uniform size, and glossy, and the color a dark-gray or brownish-gray, not perfectly black. A very little placed on a piece of paper and fired should instantly explode with a flash, and neither leave an appreciable residue on the paper nor burn it. Dried by the heat of boiling water, or in vacuo, it should not lose more than ½ to 1 % of its weight. Damp powder rapidly "fouls" the gun. *G.* containing more than 7 % of water does not recover its strength by simply drying it. The sp. gr. ranges between 1.795 and 1.800. The explosion of *G.* is another expression for the sudden expansion of a solid into a gas that occupies nearly 2,000 times as much space. As the gas *will* find room for itself, it expels a ball from a cannon with enormous velocity, or a bullet from a gun or pistol, or bursts open rocks in a quarry or mine, or dislocates into a thousand fragments the sunken hull of a wrecked ship, or blows up any building in which it may have been incautiously stored. In pyrotechny, *G.* is used in many modified forms, to produce brilliant colors and fiery trains, as well as loud reports. — As it is dangerous to carry *G.* from place to place, except under great precautions, means have been devised for rendering it temporarily non-explosive. It has been shown, for instance, that if finely powdered glass be mixed with it, the *G.* will not explode, even if a light be held to it. The minute particles of glass form a protective shield to each grain. The practical difficulty is, that the mixture must undergo a dangerous process of sifting before it can be restored to usable form. — *G.* is manufactured in many parts of the U. States, chiefly in Delaware, Massachusetts, and New York. It is usually packed in casks containing 25, 50, or 100 lbs. Its transport and storage are subject to very strict State, municipal, and harbor regulations, which differ in different States and cities. See DANGEROUS GOODS.

Imp. duty: valued at not over 20 cts. per lb., 6 cts. per lb. and 20 per cent; valued over 20 cts., 10 cts. per lb. and 20 per cent.

Gunpowder Tea, a very fine kind of green hyson tea.

Gunshot. "Within gunshot" is within the distance a piece of artillery will carry.

Gunsmith, an armorer; a maker of small fire-arms; a repairer of guns.

Gunstock, the wood in which the barrel of a gun is fixed, usually walnut.

Gun-Tackle, the blocks and pulleys of a gun-carriage affixed to the side of a ship, by which it is run in and out of the port-hole.

Gun-Tackle Purchase, a purchase or pulley made by two single blocks.

Guntang, an Indian dry measure of rather more than 15 lbs.

Gunter's Chain, a surveyor's measure named after the inventor. It is 66 feet, or 4 poles, in length, and consists of 100 links, each of which is joined to the adjacent one by three rings. The length of each link, including the connecting rings, is 7.92 inches. The advantage of this measure consists in the facility which it affords for numerical calculations. The English acre contains 4,840 sq. yds.; and Gunter's chain being 22 yds. in length, the square of which is 484, it follows that a square chain is exactly the tenth part of an acre. A square chain, again, contains 10,000 square links, so that 100,000 links are equal to an acre; consequently, the area of a field being estimated in square links, it is only necessary to divide the result by 100,000, or to cut off the last five figures, to obtain the area expressed in acres. — *Gunter's Line*, a logarithmic line engraved on scales, sectors, etc., serving to perform the multiplication and division of numbers instrumentally, as a table of logarithms does arithmetically. The numbers are usually drawn on two separate rulers sliding against each other. In rough calculations this line affords considerable facilities. — *Gunter's Quadrant*, a quadrant of a peculiar kind, adapted to the problems of finding the hour of the day, the sun's azimuth, and other common problems of the sphere. — *Gunter's Scale*, a large plane scale, having various lines of numbers engraved on it, by means of which questions in navigation are resolved with the aid of a pair of compasses. It is usually called the *Gunter* by seamen. On one side of the scale the natural lines (as the line of chords, the line of sines, tangents, rhombs, etc.) are placed; on the other the corresponding logarithmic ones.

Gun-Wadding, circular pieces of cardboard, cloth, felt, and chemically prepared substances, used to keep down the charge of ball or shot, etc., in a gun. In large guns rope wads are used.

Gunwale, the upper rail of a boat or vessel.

Gurancux, a recovered dye-stuff from spent madder.

Gura-Nut, a species of large red bean, with a bitter taste, growing on the West coast of Africa, much prized by the natives of the interior for its tonic properties.

Gurglet, a porous earthen jar for cooling water.

Gurjun, an oleo-resin; a thin balsam or wood oil, obtained in Burmah and the Eastern Archipelago from *Dipterocarpus lævis*, and other species. It is used medicinally, and forms an excellent substitute for linseed-oil in the coarser kinds of house and ship painting. Mixed with dammar or resin, it preserves wood from the attacks of white ants.

Gurlet, a pickaxe used by masons, etc., having one sharp point and one cutting-edge.

Gurmies, in mining, levels or workings.

Gurrah, a plain coarse Indian muslin.

Gurt, a gutter, or channel for water.

Gusset, an insertion or piece let into a fabric or garment.

Gut, prepared sheep's entrails (see CATGUT). — The substance made by pulling asunder a silk-worm when about to spin its cocoon, and drawing the latter into a thread, which, after being dried, is very strong and is much used for fish-lines.

Gutta-Percha, the concrete juice of the *Isonandro gutta*, a tree growing only in the Malayan Archipelago, and of other species of the same genus. The stem of the *G.-P.* tree grows to the diameter of 5 or 6 feet, and on being notched yields a milky juice, which, after exposure to the air for some time, solidifies, forming the *G.-P.* of commerce. It arrives in this country in irregular blocks of some pounds in weight, usually containing a large portion of impurities in the form of pieces of wood, stones, and earth. To prepare this crude product for manufacturing into useful articles, the blocks are first cut into slices, and then torn into shreds. These are softened by hot water, and kneaded in a "masticator," the stones, earth, and other impurities being gradually washed away by water. After several hours the *G.-P.* is found to be kneaded into a perfectly homogeneous mass, which is rolled or drawn into sheets, bands, or tubes, as required. — *G.-P.* is a tough, inelastic substance, becoming soft and plastic at 212° F., at which temperature two pieces may be firmly welded together. It is one of the best insulators of electricity, is impervious to moisture, and resists the action of acids and alkalies to a great extent. Its best solvents are benzole, chloroform, bisulphuret of carbon, rectified mineral naphtha, and rectified oil of turpentine. All these dissolve it readily. The purified *G.-P.* of commerce consists of 75 to 828 parts of chemically pure *G.-P.*, which is insoluble in ether and alcohol, and a white and a yellow resin, soluble in boiling alcohol. — The uses of *G.-P.* are numerous and varied. No substance, perhaps with the exception of india-rubber, has been "tortured" to so many different purposes. Its perfect plasticity when warm, and its capability of receiving the most delicate impressions, render it invaluable in many cases where india-rubber would be useless. Beautiful mouldings, picture-frames, and a number of ornamental articles are made from it. To the chemist and photographer it is of great use as a material for making bottles, carboys, photographic baths, and voltaic battery cells. One of the most important uses to which it has been applied is for enclosing the metallic wires used for telegraphic purposes. Its indestructibility by water, its plasticity and high insulating power, have rendered it particularly valuable for this purpose. *G.-P.* may be rolled into thin, transparent sheets, which, being perfectly impervious to moisture, are well adapted for surgical, dental, and florists' and hatters' special uses; also for leather-cement, and for horse-shoe stuffing to prevent balling in winter. Again, a solution of *G.-P.* in chloroform forms an excellent dressing for incised wounds, and a protection for abraded surfaces, burns, etc. It is used in the same way as collodion.

Imp. duty: unmanufactured, or crude, free; manufactured, or in smooth sheets, 40 per cent.

Gutter, a channel or sewer.

Gutter-Spout, a spout for carrying off water from a roof.

Guy, a rope used to steady any weighty body while it is being hoisted or lowered; also, a tackle to confine a boom forward to prevent the sail from gibing. Guy likewise denotes a large rope extending from the head of the main-mast to that of the

foremast, to sustain the tackle used for loading and unloading the ship.

Guz, an Indian name for the yard or cloth measure, which varies in length in different places, from about 2 to 3 feet.

Gybe, a nautical term for the shifting over of the boom of a fore-and-aft sail in tacking, etc.

Gyle, a brewer's vat or utensil. — A name given by the vinegar-maker to the fermented wort which he uses.

Gymnasium, a public place, or school-yard, where feats of strength, agility, etc., are practised, such as climbing, leaping, etc.

Gymnast, an athlete ; an instructor in exercises of the body.

Gynahs, gold and silver ornaments used by the natives of India.

Gypsum, native sulphate of lime, found diffused in other rocks, chiefly new red sandstone, in several parts of Europe, and in Nova Scotia, whence it is largely exported. Certain properties which it possesses render it valuable in the preparation of moulds and casts. When mixed with water to a pasty or fluid state, it constitutes *plaster of Paris;* and solidifying very soon afterwards, can be almost immediately removed from the mould or pattern. For making fine plaster the *G.* is broken into small pieces, calcined in an oven, ground between stones, and sifted to a fine powder. Considerable tact is required in determining the quantity of water necessary to be added to this powder, and the mode of adding it. To prevent the plaster cast from adhering to the model or mould which gives it form, the latter is first brushed over with oil or with white of egg. Moulds are often made in plaster of Paris, whether the casts are to be of that substance or of metal, such as *stereotype;* and casts are often made of it where the moulds are of plaster, sulphur, or wax. Fine gypsum is also used as an ingredient in porcelain and best earthenware. The coarser specimens are kiln-burnt, and mixed with water into builders' cement for walls, floors, etc. Some of the harder kinds of gypsum are noticed under ALABASTER.

Gyroscope, an instrument for illustrating the tendency of a revolving body to maintain its rotation in a fixed plane when free from the influence of disturbing forces, and which, towards the middle of this century, attracted for some time much attention on account of its supposed capability of rendering visible the rotation of the earth on its axis.

Gyves, fetters or shackles for the legs.

H

Haaf-Boat, a deep-sea fishing-boat in Scotland, probably a corruption of half-decked boat.

Habbie, a Syrian dry measure; 100 habbies of Jaffa being equal to 39 quarters.

Habeck, a clothier's tool, used in dressing cloth.

Haberdasher, a term seldom used in this country, but generally applied in England to dealers in small wares, such as sewing-threads, laces and tapes, fringes and twists, buttons, hooks and eyes, trimmings, etc. It is often combined with the woollen-drapery trade. Haberdasheries formerly included numerous articles now dealt in by other trades, as hats, clothes, glasses, spoons, etc.

Haberdine, a dried salted codfish.

Habillement [Fr.], garments, clothing, gear.

Habit-Maker, a tailor who makes long cloth riding-coats, or dresses for ladies, termed habits.

Habit-Shirt, a thin muslin or lace garment, worn over the breast and neck by females.

Hacienda, the Spanish name for a farm or plantation.

Hack, a worn-out horse. — A frame suspended from the roof for drying cheeses. — The wooden bars in the tailrace of a mill. — A framework for drying fish. — A dung-fork. — A large pick used in working stone. — In Scotland, a fodder for cattle. — A tool for cutting jags or channels in trees for the purpose of bleeding them. — To use much. — To hew or cut.

Hackberry, the *Celtis occidentalis*, an ornamental tree of the U. States; of medium size. The wood is hard, close-grained, and elastic, and makes the best of hoops, whipstocks, and thills for carriages. The Indians formerly made great use of it for their bows.

Hackbrett, the German name for the dulcimer.

Hackery, an Indian bullock-cart, capable of carrying a load of about 12 maunds, or from 900 to 1,000 lbs.

Hackle, Heckle, Hatchel, an instrument with teeth, or a board set with sharp steel spikes, for combing hemp or flax, and separating the *tow* or *hands* from the finer fibre (see FLAX). — A fly for angling, dressed merely with a cock's feather.

Hackles, the long shining feathers from the cock's neck, used to make artificial flies.

Hackmatack, a name for the timber of the tamarack, or American larch (*Larix Americana*), a useful building wood, much used in ship-building in the Eastern States.

Hackney-Coach, an English term for a public carriage plying in the streets for hire; now almost obsolete, from the general introduction of cabs and omnibuses. *H.-C.* are of French origin. In France, a strong kind of cob-horse (*haquenée*) was let out on hire for short journeys; these were latterly harnessed, to accommodate several wayfarers at once, to a plain vehicle, called *coche-à-haquenée*, — hence the name.

Haddock, a small species of codfish, the *Morrhua æglefinus*, which is very abundant along our eastern coasts from New York to the Arctic regions. It is less esteemed and much cheaper than the cod; its flesh is, however, sweet and wholesome, and as it comes at the season when cod is scarce, it is a fish of considerable value. It is caught, cured, packed, and sold as the cod.

Hadeed, a cloth measure in Turkey, of about 34 inches.

Haft, the handle of a tool or knife. The manufacture of hafts or handles for cutlery is a vast branch of industry, employing large numbers of men, and necessitating the use of a singularly wide range of substances. Soft wood, hard wood, ebony, lignum-vitæ, vulcanized india-rubber, ivory, bone, hoof, horn, pearl, shell, tortoise-shell, iron, brass, gold, silver, — all are employed, and many other substances besides, either singly or in combination. To bring these substances into shape, almost every mechanical process known in the arts is employed, — sawing, planing, turning, carving, stamping, forging, casting, embossing, inlaying, plating, electro-plating, grinding, polishing, engraving, etc., according to the value, form, and size of each handle. Some handles are made by riveting flat pieces of bone, etc., upon a flat iron continuation of the blade; some by the *through fang*, an iron prong projecting from the blade, fitted into a hole drilled right through the handle, and riveted at the end; some by a shorter prong fixed into a shorter hole by resin solder; and some by weighting the interior of the handle with a little lead, to give the *balance* action to the blade.

Haft-and-Scale Cutter, one who shapes, cuts, or presses, bone and horn handles, for cutting instruments.

Haggis-Bag, the maw of a sheep, used to make a haggis in. The haggis, a national dish in Scotland, is a baked mess of sheep's entrails, thickened with oatmeal and seasoned.

Haggle, to be tedious in making a bargain; to be long in fixing a price; to hesitate; to cavil.

Hague (The). See HOLLAND.

Haik, a woollen or cotton cloth worn by Arabs over the tunic, but under the bernouse.

Hail, to speak aloud or call to another.

Hailoh, a long measure at Sumatra, equal to 4 feet.

Haim [Fr.], a fish-hook.

Hainan. (See CHINA.)

Hair [Fr. *cheveu;* Ger. *Haar, Menschen-haar;* It. *capello umano;* Sp. *cabello*]. Human *H.* makes a very considerable article in commerce, especially since the mode of perukes and chignons has obtained. Good *H.* is well fed, and neither too coarse nor too slender; the bigness rendering it less susceptible of the artificial curl, and disposing it rather to frizzle; and the smallness making its curl of too short duration. Its length should be about 25 inches; the more it falls short of this the less value it bears. A head of girl's *H.*, as usually imported, weighs from 1½ to 1¾ lbs. The lighter colored *H.*, which bears the highest value, is the production of Germany; the darker shades are imported from Belgium, France, Italy, and Spain. The value of *H.* changes with the fashion, which is subject to violent fluctuations; the price has been known to range from $1 to as much as $20 per lb., especially when golden tresses were in favor, seeing that golden *H.* is comparatively a rarity.

Hair of Beasts [Fr. *poil, crin;* Ger. *Haar, Huhaar;* It. and Sp. *pelo*]. In its mechanical nature *H.* may be regarded as a condensed form of cuticle. The feathers of birds may be considered as analogous to H., while the only two classes of animals that are wholly devoid of any kind of *H.* are the fishes and reptiles. The variety in the conformation of *H.* is very great, ranging from the finest wool to the quills of the porcupine or the horn of the rhinoceros, which last is nothing

more than an assemblage of many hairs in one compact mass.

Hair Manufacture. The various uses to which *H.* is applied are familiar to every one. The most valuable kind is human *H.* The making of wigs, perukes, beards, whiskers, mustaches, eyebrows, fronts, chignons, etc., constitutes a trade in itself, in which many ingenious processes are involved. Belonging to what may be called the chemistry of the trade is the preparation of *H. dyes*, *H. washes*, *H. pomades*, and *H. powders*. How far the artist succeeds in increasing the beauty of human *H.* by these additions is a matter of fashion and individual taste; but the amount of trade done in this way is very large — *Horsehair.* To prepare it for manufacturers, horsehair is classified into *best*, *seconds*, *black*, *gray*, *soft*, *hard*, *curling*, *spinning*, *weaving*, etc. To prepare the *curled H.* for stuffing cushions, etc., short horsehair is carded between teeth or combs, *tipped* or beaten in a heap with a cane, *curled* into a kind of large rope, *steeped* in cold water, *heated* in an oven, *opened* by partial uncurling in an opposite direction, and *teazed* or picked into curling pieces, which acquire a remarkable springy quality. Short white *H.* is used for brushes. *H.* of medium length is spun into clothes-lines, and woven into filtering-bags, etc. The long *H.*, by processes of *heckling*, *carding*, etc., is woven up into *horsehair cloth*, for sofa coverings, and so forth, which has a black, flaxen warp with a horsehair weft, each weft thread consisting of a single *H.* According to the length of the *H.*, so can this cloth be made of widths varying from 14 to 40 inches. Long white *H.* are used for violin bows and fishing-lines. At some of the industrial exhibitions there have been displayed, from Russia, bowls, dishes, and plates made of hare and rabbit *H.*, felted into a tough layer, and varnished: they had something the appearance of papier-mâché. These, however, were examples rather of fur-work than of *H*-work. For various purposes in the arts, the *H.* of the camel, fitch, sable, hog, cow, badger, goat, dog, and other animals is used.

Imp duty: *H.* of all kinds, cleansed or uncleansed, but not manufactured, not otherwise provided for, 10 per cent. All manufactures of *H.*, not otherwise provided for, 30 per cent. Bracelets, braids, chains, curls, and ringlets of *H.* or partly of *H.*, 35 per cent. Hogs' *H.*, 1 ct. per lb. Hogs' *H.*, curled, for beds and mattresses, and not fit for bristles, free. Horse and cattle *H.*, cleaned or not, drawn or not, but unmanuf., free. Horse *H.*, long for weaving, cleaned or not, free. Human *H.*, cleansed or drawn, or prepared for use, but not manuf., 30 per cent. Human *H.*, manuf., 40 per cent. Human *H.*, raw, uncleaned, and not drawn, 20 per cent. See also BRISTLES, HAIR-CLOTH, HAT, NET, WOOL, etc.

Hair-Breadth, a nominal measure of length, the 48th part of an inch.

Hair-Broom, a long-handled sweeping-broom for servants.

Hair-Brush, a toilet-brush for smoothing and dressing the hair.

Hair-Cloth, a woven fabric of horsehair. The hair used for weaving consists of the long hair from horses' tails. It is procured principally from South America and from Russia. All the black and gray hair is dyed for the manufacture of black *H.-C.* for covering furniture. The white is reserved for dyeing of the brighter hues, such as green, claret, crimson, etc. The quality of the cloth, as well as the brilliancy and permanency of the colors depends in a great degree on the nature of the warp, which may be either of cotton, linen, or worsted. In the manufacture of *H.-C.*, either plain or damasked, the weaver uses a sort of hook-shuttle, which he passes between the threads of the warp, or shed, towards his left hand; the assistant, or "server," places a single hair over the end of the hook, and the weaver draws it through the warp. The placing of the hairs one by one renders this a tedious operation, and one that does not admit of the application of machinery, which is so advantageously employed in fabrics where the shot or weft consists of a continuous thread. An imitation of *H.-C.* is made by the use of hard-twisted and highly gummed and polished cotton threads.

Imp. duty: *H.-C.*, known as hair-seating, 18 inches wide or over, 40 cts. per sq. yard; the same, less than 18 inches wide, 30 cts. per sq. yard; *H.-C.*, not otherwise provided for, 30 per cent.

Hair-Cord, a cotton goods, the warp of which consists of corded ribs.

Hair Cosmetics, under this head are included all preparations which are used for beautifying, preserving, or restoring the hair. These are described in different parts of this work, and we shall here merely name the principal heads under which they will be found. The hard pomatum used for keeping the hair, mustache, and whiskers in form, and sometimes to color them at the same time, is noticed under COSMETIQUE; the mucilaginous preparation for stiffening the hair, under BANDOLINE; the compounds for removing superfluous hairs, under DEPILATORY; the applications for the cure and prevention of baldness, under POMADE and WASH; and those employed to cleanse or beautify the hair under the last two heads, and under HAIR-DYE and OIL.

Hair-Dresser, an artist who trims and arranges the hair; a barber, who often combines the sale of perfumery and toilet articles.

Hair-Dye. The practice of dyeing the hair is of great antiquity; and though not so common as formerly, it is still far from infrequent at the present day. The numerous preparations vended for this purpose have generally a basis of lead or silver. Bismuth, pyrogallic acid, and certain astringent vegetable juices are also occasionally thus employed. The following list embraces about all those of any value: —

1. Litharge, 1 part; fresh-slaked lime and starch, of each 2 parts; all in fine powder, and perfectly dry; mix, and keep the compound in well-corked bottles. This powder is to be made into a thin paste or cream with water (for black) or milk (for brown), and applied to the hair (previously freed from grease with soap and water, and dried) by means of a sponge or brush, or the fingers; observing to rub it well into the roots, and to pass a comb for some time through it, to insure its coming in contact with every part. The whole must be then covered with a moist leaf of cotton wadding, or some brown paper several times doubled and well damped with hot water, and allowed to remain so for 3 or 4 hours, or even longer: or an oil-silk cap, or a bladder, may be worn, the object being simply to prevent the evaporation of the moisture. After a sufficient time has elapsed the powder may be removed by rubbing it off with the fingers, and afterwards washing it out with warm soap-and-water. A little pomatum or hair-oil will restore the usual gloss to the hair. Another method of operating is to apply the cream or paste as before, and then to keep rubbing it about the hair with a brush as long as may be required, occasionally adding a few drops of hot water to preserve the whole moist. In this way the action of the dye is facilitated, and the process concluded in a much shorter time. — 2. Lime (slaked in the air), 2 parts; carbonate of lead (pure white lead), 1 part; mixed and applied as the last. — 3. (*Aqua Orientalis.*) From grain silver, 2 dr.; steel filings, 4 dr.; nitric acid, 1 oz.; soft water, 1½ fl. oz.: digested together, the solution being afterwards diluted with water, 3½ fl. oz., and filtered. Applied by means of a fine-toothed comb, or a half worn tooth-brush, to the hair, previously well cleaned with soap and water, and dried. — 4. (*Hair Restorer.*) This is in reality a dye. Sulphur, 45 gr.; acetate of lead, 20 gr.; glycerine ½ oz.; water to make up 10 oz. — 5. (*Golden Hair-dye Aureoline.*) A solution of peroxide of hydrogen in water, containing from 3 to 6 per cent of the peroxide. — 6. (*Brown Hair-dye.*) Acetate of lead, 2 dr.; hyposulphate of soda, 1 dr.; rose-water, 14 oz.; glycerine, 2 oz. Dissolve the acetate of lead and the hyposulphate in separate portions of the rose-water: filter separately, mix the solutions, and add the glycerine. — 7. (*A harmless hair-dye.*) Ten parts of subnitrate of bismuth and 150 parts of glycerine are mixed in a glass vessel and heated in a water bath; solution of potash is then added in small portions, and with continued agitation, until a clear solution has been obtained, to which a concentrated solution of citric acid is added until merely a slight alkaline reaction is observed. Enough orange-flower water is added to make the whole liquid weigh 300 parts; the addition of a small quantity of a solution of an aniline color completes the preparation. — 8. Fresh-slaked lime, 5 dr.; water, 1½ oz.; mix, strain through gauze, and pour the milk into a four-ounce bottle. Next dissolve sugar of lead, 5 dr., in water, 3 fl. oz.; add to this solution dry slaked lime, 1 dr., stir well together, wash the precipitate with a little soft water, drain off the water, then add it to the milk of lime in the bottle, and shake the whole well together, and again before use. Applied as No. 1; but it acts much more quickly. — 9. (*Tincture of*

Walnut.) A strong tincture of the shells of green walnuts, scented with oil of lavender. — 10. Litharge, fresh-slaked lime, and bicarbonate of potassa, mixed in various proportions, according to the shade of color desired. Used like No. 1.

Hair Gloves, horsehair gloves used for rubbing the skin in bathing, etc.

Hair-Line, a horsehair fishing line.

Hair-Net, a net for enclosing a lady's hair.

Hair-Oil, scented oil for moistening the hair.

Hair-Pencils, small brushes used by artists made of the fine hairs of the marten, badger, pole-cat, etc., mounted in quills or white iron tubes. See Brush.

Hair-Pin, a double pin or bent wire for confining a lady's hair. — Also a *corking-pin*, or pin used in fastening up the hair.

Hair-Powder, a fine powder, generally made from starch pulverized, and sometimes perfumed. It was much used in the 18th century for sprinkling upon the hair of the head, or upon the wig. It is still worn by footmen in England.

Hair Seating, woven horsehair, used for covering chairs, couches, and cushions.

Hair Sieve, a sieve or strainer with a woven horsehair bottom.

Hair-Worker, a fancy workman in hair, who makes ornaments for wear; bracelets, lockets, pictures, etc., in human hair.

Hake, a shed for drying draining tiles. — A large fish, the *Merlucius vulgaris*, frequently found three feet in length; common in the Atlantic seas and the Mediterranean. It is split and dry-cured like cod, and often passes under the name of stock-fish.

Hakeem, an Eastern physician.

Haken, a wooden frame-harrow without teeth, used in parts of Belgium.

Halberd, a military spear or pole-axe. — The cross-bar on a horseshoe.

Half, a moiety; one part of a thing which is divided into two equal parts, commercially expressed by vulgar or decimal fractions, as $\frac{1}{2}$ or $\frac{50}{100}$ or 0.50.

Halfa. See Alfa.

Half-and-Half, a mixture of beer or porter and ale.

Half-Binding, a style of book-binding in which the backs and corners are of leather and the sides of paper or muslin.

Half-Boarder, a day-boarder at a school; a scholar not permanently resident.

Half-Bred, a mongrel. — A race-horse not pure-blooded. — A coursing dog not completely trained.

Half-Bushel. See Bushel.

Half-Cent, a copper coin of the U. States, of the value of 5 mills. 7,985,343 pieces were coined down to 1857, when the coinage of the half-cent was discontinued; very few now remain in circulation.

Half-Dime, none has been coined since 1851. See Dime.

Half-Dollar. See Dollar.

Half-Eagle. See Eagle.

Half-Farthing, a British copper coin, the 8th part of a penny, worth about $\frac{1}{4}$ of a cent.

Half-Hose, stockings which reach only about half-way to the knee.

Half-Hundred, a weight of 56 lbs.

Half-Imperial, a kind of mill-board $23\frac{1}{2}$ by $16\frac{1}{2}$ inches; the whole imperial is 32 by $22\frac{1}{2}$.

Half-Moon Knife, a double-handled and crescent-shaped knife used by the dresser of skins for parchment.

Half-Ounce, the moiety of the ounce, which in avoirdupois is $218\frac{3}{4}$ grains; in troy weight, 240 grains.

Half-Pay, a moiety of the usual pay.

Half-Penny, a piece of two farthings, the second in value of the British current copper coins, weighing 146 grains; 48 weigh a pound avoirdupois. It is worth about one cent.

Half-Pike, a boarding-pike used in ships.

Half-Pint, a measure of two gills, the fourth part of a quart, and = 17.3296 cubic inches.

Half-Pound, 6 ounces troy, or 8 ounces avoirdupois.

Half-Price, half the cost; in trade, much under the current price.

Half-Royal, a kind of mill-board, of which there are two sizes, small $20\frac{1}{2}$ by 13 inches, and large 21 by 14; large whole royal is $26\frac{3}{4}$ by $20\frac{3}{4}$; long royal is 34 by 21, double royal, 46 by 21.

Half-Sovereign, the second in value of the British current gold coins, weighing 2 dwts. 13.63724 grains, and worth 10*s*. (2.433\frac{1}{2}$).

Half-Stuff, in manufactures, any thing half-formed; the name for a partially prepared pulp for paper-making.

Half-Way, midway; equidistant from the extremes.

Hali, a weight used in Malacca, about 32 lbs. avoirdupois.

Halibut, a large flat fish of the flounder family, the *Hippoglossus vulgaris*, which often reaches the weight of 300 lbs. or more. They are caught in large numbers off the coast of New England. The flesh is dry and coarse. It is lightly salted and smoked, in which state it forms an important article of commerce. It is also cut into slices and pickled in barrels, selling at about half the price of the best herring. The fins and flaps are esteemed delicious.

Hakodate, or **Hakodadi**. See Japan.

Halifax, a seaport and city of the Dominion of Canada, the capital of Nova Scotia, on the S. E. coast of that province, lat. 44° 36′ N., lon. 63° 28′ W. It is situated on a peninsula on the W. side of Chebucto Bay, and has one of the finest harbors in America. The best mark in sailing for *H.* is Sambro Light-house, on a small island off the cape of the same name, on the W. side of the entrance to the harbor, in lat. 44° 30′, lon. 63° 32′. The light, which is fixed, is 210 feet above the level of the sea; and a detachment of artillery, with two 24-pounders, is upon duty at the light-house, firing at regular intervals during the continuance of the dense fogs with which this part of the coast is very much infested. The course into the harbor for large ships after passing Sambro Light is between the mainland on the W. and Macnab's Island on the E. On a spit projecting from the latter a light-house has recently been constructed; and when this is seen ships may run in without fear. The harbor is defended by several strong forts. Ships usually anchor abreast of the town, where the harbor is rather more than 1 mile in width. After gradually narrowing to about $\frac{1}{4}$ that width, it suddenly expands into a noble sheet of water, called Bedford Basin, completely land-locked, with deep water throughout, and capable of accommodating the whole navy of Great Britain. The harbor is accessible at all times, and is rarely impeded by ice. There is an extensive royal dock-yard at *H.*, which during war is an important naval station, being particularly well calculated for the shelter, repair, and outfit of the fleets cruising on the American coast and in the West Indies. A canal connects *H.* harbor with Cobequid Bay and the Bay of Fundy. Since its first settlement, in 1749, *H.* has continued to be the seat of a profitable fishery; and its general com-

merce is highly prosperous, engrossing as it does nearly the whole foreign trade of Nova Scotia. In 1817 *H.* was declared a free port to a certain extent, and has since acquired the privilege of warehousing. Some ships of large size are employed in the South-Sea fishery, but, generally speaking, the inhabitants are less enterprising and successful fishers than the New-Englanders. Mail-steamers sail between *H.* and Liverpool and Falmouth, England, and other packets regularly to Boston, New York, and the W. Indies. Pop. 29,582.

Halle, a French market-place.

Halliard. See HALYARDS.

Hallier, a birding-net.

Hall-Mark, in England, the official stamps, affixed by the Goldsmiths' Company and the assay officer of particular districts, to articles of gold and silver, as a test of their legal quality. The hall-mark of Birmingham is an anchor; of Chester, three wheat-sheaves or a dagger; Dublin, a harp, or figure of Britannia; Edinburgh, a thistle, or castle and lion; Exeter, a castle with two wings; Glasgow, a tree and a salmon with a ring in its mouth; London, a leopard's head; Newcastle-on-Tyne, three castles; Sheffield, a crown; York, five lions and a cross. The date mark is a letter of the alphabet, which is changed every year, and differs in different companies. See STANDARD MARK.

Hallotype, same as Hellenotype.

Halometer, an instrument for measuring the forms and angles of salts and crystals.

Haloscope, an optical instrument invented by A. Bravais, for exhibiting the phenomena of halos, parhelia, etc.

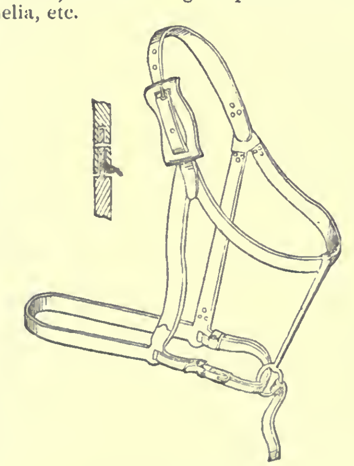

Fig. 255. — HALTER.

Halter, a rope or strap and headstall (Fig. 255) for leading or securing a horse. — A rope for hanging malefactors.

Halvans, impure ores, which require to be washed and freed from impurities.

Halve, to divide or share into equal portions.

Halve-Net, in Scotland, a fixed bag-net, placed within water-mark, to prevent fish returning with the tide.

Halyards, ropes or tackles used for hoisting or lowering yards and sails on their respective masts.

Ham and Bacon. The former is made from the hind legs of the pig, the latter from its sides and belly. The process of curing may be effected indifferently by the employment of salt or sugar, or both; but the first is by far the most commonly used. After being impregnated with salt or sugar, and allowed to remain a certain time in the solution, the hams and bacon are taken out, dried and smoked. In Chicago, Cincinnati, Louisville, Baltimore, New York, etc., large quantities of bacon and hams are put up yearly for domestic use and export. Bacon is packed and shipped in boxes. Hams are commonly packed in tierces, the number of hams in the tierce and the total weight being marked on the end. In Philadelphia, Baltimore, and the Southern States all smoked pork, including hams, are termed bacon, and the classification most generally adopted is Cumberland middles, which takes in the whole side from ham and shoulder; long clear middles; and short clear middles. Roaming over the mountains of West Virginia there is a small variety of the hog, whose hams are celebrated for the excellence of their flavor. The most celebrated hams in Europe are those of Westphalia in Prussia, of York in England, and of Bayonne in France. Bacon and hams are one of the most important articles of commerce in the U. States. The exports, which for the past years have been steadily increasing, amounted for the year 1878 to the enormous total of 592,814,351 lbs., valued at $51,752,068. See HOG.

Hamals, porters in Constantinople who carry immense weights between them, suspended on poles supported on their shoulders.

Hamburg, a small but commercially important state of N. W. Germany, the territories of which comprise the free city of Hamburg and the country immediately surrounding it, some islands in the Elbe, and several small detached districts enclosed by the duchy of Holstein. The little state is bounded on all sides by Holstein, except on the S. and S. W., where the Elbe separates it from Hanover. Area, 148 sq. m. Besides the Elbe, it is watered by the Alster and Bille. It is generally a level plain, not particularly fertile, except in the Vierländer district, to the S. E. A good deal of land is devoted to fruit, flowers, and vegetable gardens, and the entire country round the city of Hamburg is dotted over with flourishing villages and plantations. According to the terms of the constitution of September 28, 1860, the government (*Staatsgewalt*) is intrusted, in common, to two Chambers of Representatives, the Senate and the Bürgerschaft, or house of Burgesses. The Senate, which exercises chiefly, but not entirely, the executive power, is composed of 18 members. Its members are elected for life by the House of Burgesses. A first and second burgomaster, chosen annually in secret ballot, preside over the meetings of the Senate. No burgomaster can be in office longer than two years; and no member of the Senate is allowed to hold any public office whatever. The House of Burgesses consists of 192 members, 84 of whom are elected in secret ballot by the votes of all tax-paying citizens. Of the remaining 108 members, 48 are chosen, also by ballot, by the owners of house property in the city valued at 3,000 marks, or $935, over and above the amount for which they are taxed; while the other 60 members are deputed by various guilds, corporations, and courts of justice. All the members of the House of Burgesses are chosen for six years, in such a manner that every three years new elections take place for one half the number. The House of Burgesses is represented, in permanence, by a Bürger-Ausschuss, or Committee of the House, consisting of 20 deputies. It is the special duty of the committee to watch the proceedings of the Senate, and the general execution of the arti-

cles of the constitution, including the laws voted by the House of Burgesses. In all matters of legislation, except taxation, the Senate has a veto; and, in case of a constitutional conflict, recourse is had to an assembly of arbitrators, chosen in equal parts from the Senate and the House of Burgesses. The revenue of the State, amounting to about $6,000,000, is mainly derived from an income-tax, the amount of which upon each contrib-

Fig. 256.—Jews' Street, Hamburg.

utor is left to self-assessment. Disbursements for public works, including the maintenance of free and unobstructed navigation of the river Elbe, the jurisdiction over which belongs entirely to *H.*, although the river flows from the port to its mouth through the territories of Prussia, form the principal part of the expenditure. The public debt of *H.* in 1878 amounted to 125,678,520 marks, or $31,419,630. In 1878 the population (including 2 battalions of Prussian soldiers, forming the garrison of *H.*) was as follows:—

	Inhabitants.
City of Hamburg with suburbs	345,801
Rural districts and Bergedorf	35,888
Cuxhaven and Ritzebüttel	6,929
Total	388,618

Hamburg, the principal commercial city, emporium, and seaport of Germany, cap. of above state, and the principal of the three existing Hanse Towns and former imperial cities of that country, is situated on the N. bank of the Elbe, at the point where it receives the Alster, about 70 m. S. E. from its mouth, 60 N. E. of Bremen, and 36 m. S. W. of Lubeck; lat. 53° 32′ 51″ N., lon. 9° 58′ 37″ E. The city is oval-shaped, is about 4 m. in circuit, and was formerly fortified, but its ramparts now serve as public walks. The principal ornament of *H* is the Alster. This river rises in Holstein, some miles above the city, and spreads out into a wide lake, which flows through deep broad ditches, some of which encircle the ramparts, while others intersect the city in all directions, forming numerous canals navigable for barges of considerable size. This lake is called the *Outer Alster*. The *Inner Alster* is a large square sheet of water, connected with the former by a narrow channel, spanned by a single arch. On three sides of the Inner Alster there are broad walks, with rows of trees, the favorite resort of the Hamburgers of all classes and all ages. The best houses in the city are to be found in its immediate neighborhood. The Jungfernsteig occupies its S. and W. sides. The whole of *H.* has been very nearly rebuilt since the disastrous fire of 1842, which raged for 3 days, and destroyed a large portion of the city. The Elbe, which may be navigated by lighters as far as Melnik, in Bohemia, renders *H.* the entrepôt of a vast extent of country. Advantage, too, has been taken of natural facilities that extend still further her internal navigation; a water communication having been established, by means of the Spree and of artificial cuts and sluices, between the Elbe and the Oder, and between the latter and the Vistula; so that a considerable part of the produce of Silesia, destined for foreign markets, and some even of that of Poland, is conveyed to *H.* There is, also, a communication by means of the Steknitz Canal with the Trave, and, consequently, with Lubeck and the Baltic. And she is connected by means of railways with Berlin, Hanover, Brunswick, Kiel, etc. Direct communication with the U. States is kept up by a most excellent line of splendid steamers running weekly between *H.* and New York. Vessels drawing 14 feet water come up to the town at all times; and vessels drawing 18 feet may come safely up with the spring tides. The largest vessels sometimes load from and unload into lighters at Cuxhaven. The trade of *H.* embraces every article that Germany either sells to or buys from foreigners. The imports consist principally of cotton, wool, stuffs, and yarn; wool, woollen, and worsted goods; coffee, which is the favorite article for speculative purchases; sugar, silk, and silk goods; tobacco, hides, iron, and hardware; indigo, wine, brandy, rum, dye-woods tea, pepper, etc.; very large quantities of coal are imported from England. Being brought from many different places, there is a great variety of quality in the grain found at *H*: but a large proportion of the wheat is inferior. Some of the barley is very good, and fit for malting. The oats are feed of various qualities. With the exception of coal, the exports consist of the same articles as the imports, *H.* not being a centre of consumption, but of distribution. In addition to colonial produce, British manufactured goods and grain of all sorts, they include wool, clover-seed, bark, spelter, cattle, butter, salted provisions, rags, wooden clocks, and toys, linens, and all sorts of German manufactured goods, Rhenish wines, etc. Most sorts of Baltic articles, such as grain, flax, iron, pitch and tar, wax, etc., may generally be bought as cheap at *H.*, allowing for difference of freight, as in the ports whence they were originally brought. The commerce of *H.* with the U. States, which is very important, is included in the general commerce of Germany (see Germany).

The total number of vessels which entered the port of *H.* in 1878 was 5,473, with an aggregate tonnage of 2,233,929. The total number of sea-going vessels (*Seeschiffe*) which belonged to the port on Jan. 1, 1880, was 104 steamers and 381 sailing vessels, with an aggregate tonnage of 227,816. The mercantile navy of *H.* is more than eight times as large as that of the kingdom of Belgium, and nearly double, in tonnage, of that of Denmark and Belgium together.

Banking. The *Bank of H.*, or *Giro*, was established in 1619 on the model of that of Amsterdam. It is purely a deposit bank for the transfer of sums from the account of one individual to that of another. It receives no deposits in coin, but only in bullion of a certain degree of fineness, charging one per mille for its expenses. It advances money on jewels to three fourths of their value. The city is answerable for all pledges deposited with the bank: they may be sold by auction if they remain one year and six weeks without any interest being paid. If the value be not claimed within three years, it is forfeited to the poor. This bank is universally admitted to be very well managed. There are besides in *H.* several joint-stock banks, the most important of which are the *North Ger-*

man Bank and the *Union Bank*, established in 1856, each with a capital of $7,500,000. They discount bills, make advances on goods, and transact all sorts of banking business. The exchange business done at *H.* is very great: for, besides the business of the place, most of the merchants in the inland towns have their bills negotiated there.

Money, Weights, and Measures. The inconveniences of the old system of money, weights, and measures of *H.* have disappeared with the introduction of the new system, which is obligatory for all the states of the Empire (see GERMANY). As, however, the old weights and measures are still frequently used in commercial transactions, we give here their English equivalents: —

MEASURES.

Hamburg.		British.
100 feet in length	=	94.021 feet in length.
" square	=	88.400 feet square.
" cubic	=	83.115 feet cubic.
100 ells (of cloth)	=	62.681 yards.
100 barrels (fass) of corn	=	18.901 imperial quarters.
100 quarterns (viertel) of liquid	=	159.470 imperial gallons.
1 commer. last of 6,000 lbs.	=	3 tons burden.
1 old ship last of 4,000 lbs.	=	2 tons burden.
1 corn last	=	11½ imperial quarters.
1 coal last of 12 tons	=	2 tons avoirdupois.

WEIGHTS.

100 new lbs. or 1 centner	=	110.232 avoirdupois.
100 marks bank weight	=	62.6554 lbs. troy.

Long Measure. — The *H.* foot, divided into 12 inches, of 8 parts each = 0.28657 mètres = 127.036 Parisian lines = 11.289 Eng. inches. Hence,

100 Hamburg feet	=	94.021 English feet.
100 " "	=	28.657 French mètres.
100 " "	=	91.307 Prussian or Rhenish feet.
100 " "	=	90.664 Vienna feet.

The *H.* ell (short ell) = 2 Hamburg feet. 05.7314 mètres = 254.072 Paris lines. 100 Hamburg ells = 62.681, Eng. yards.

The Brabant elle (or long ell) most commonly used in *H* in measurement of piece goods = 27.585 Eng inches.

Liquid Measure. 1 fuder = 6 aums, 1½ aums = 4 ankers or 5 eimers; 1 anker = 5 viertels; 1 viertel = 2 stübchens; 1 stübchen = 2 kannens; 1 kannen = 2 quarters of Oessel; 1 eimer = 4 viertels; 1 hogshead = 1½ aums, or 6 ankers, or 30 viertels, each of 8 quartiers or bottles.

The stübchen contains 265 *H.* cubic inches = 3.62 litres.

100 Hamburg viertela	=	159.39 English imperial gallons.
100 " "	=	724.18 French litres.
100 " "	=	632.45 Prussian quarters.
100 " "	=	511.88 Vienna maas.

The full beer barrel contains 48 stübchens, or 192 quartiers: the small barrel only 32 stübchens, or 128 quartiers.

The vinegar barrel contains 30 stübchens, or 120 quartiers.

The whale and fish oil barrel contains 32 stübchens, or 128 quartiers; 2 whale oil barrels = 1 quarteel.

Grain Measure. Corn is sold by weight, and the last is supposed to contain in

	lbs. avoir.		lbs. avoir.
Wheat	5,400	Malt	3,000
Rye	5,100	Pease	3,000
Barley	4,800	Beans	5,520
Oats	3,600		

In practice one *H.* last is taken at 11 imperial quarters, 31 hectolitres, 57 Prussian scheffels, 25 Danish barrels, and 16½ Russian chetwerts.

The coal barrel contains (when the 1,453 *H.* cubic inches of head or heaped measure is added) 16,438 cubic inches.

The *H.* ship last, or last of commerce, really weighs 6,000 pounds, or 3 tons (not 4,000 pounds, as is generally stated).

Duties. There are no export duties, and the import duty is only ½ per cent. The following articles are free even of this low duty: 1. Wool, raw cotton, silk, flax, yarn and manufactured girths of flax, hemp, rags, old ropes, used linen cloth, and empty bags; 2. Corn, potatoes, and rape-seed; 3. Unmanufactured copper and brass, copper ore, rough spelter and old zinc, nickel and nickel ore, cobalt and cobalt ore, bell metal, and old metal vessels, etc., for smelting; 4. Bullion and coin, unworked gold and silver, waste derived from the precious metals, gold dust, silver ore and ore containing silver, precious stones not set, pearls, and jewels; 5. Printed books, music, maps, etc.; 6 Oil-cakes, bark, bones, offal of various kinds, guano, and blood manure; 7. Coals, cinders, turf, timber, staves, and wood for burning, chalk and limestone, slates, cement and cement stone; 8. Live animals, with the exception of oysters and leeches, game and poultry, fresh fruit, and various agricultural productions; 9. Passenger luggage, dowries and heritages; but in part under certain conditions and restrictions. — *Goods in Transit.* Not only *H.* citizens, but foreigners, are enabled to declare goods *in transitu* upon payment of a fee of 25 marks courant on the transaction, and depositing or giving security to the government for 1,000 marks banco. The levy of duties in *H.* is conducted in the simplest manner, and on the most liberal footing. No vexatious forms check the free intercourse or the free course of trade: the entry for duty is merely a declaration of the current value at the time: transitu articles remaining in warehouse for exportation require a mere declaration to that effect by a burger or citizen. In levying duties no advantage is claimed by *H.* for vessels bearing her own flag; goods by all vessels, from whatever quarter of the world, paying the same duties. Though she now carries the German flag, she, like the other Hanse Towns, remains a free port outside the customs frontier until she signifies a wish to be admitted to it. But for this privilege she is obliged to pay an annual sum, called an aversum, equivalent to the customs duties that would otherwise have been levied within its territory. It amounted to $511,500 in 1878, equal to a charge of $1.98 per head of population. The low rates of duty in *H.* is a proof of her anxious desire to encourage trade with all nations: and the more so when we consider the great expense she is put to in keeping up buoys along the Lower Elbe, and other necessary charges for navigating that river; expenses which considerably exceed the total sum received for duties.

Custom House Regulations. On a vessel's arrival at *H.* the broker reports her to the custom-house, gives his guaranty for payment of the duties, delivers her papers, and the vessel is allowed to unload. On clearing, a manifest of the outward cargo, together with the consul's certificate of the regularity of the ship's papers, must be produced at the custom-house by the broker, who obtains in return a clearance certificate, authorizing the vessel to go to sea.

Insurance, etc. All sorts of insurances are effected at *H.* A municipal regulation compels the insurance of all houses within the city, the rate varying according to the number of fires and the amount of loss. Marine insurance is principally effected by joint-stock companies, of which there are several; their competition has reduced the premiums to the lowest level, and the business is not understood to be profitable. The high duties on policies of insurance in England have led to the insuring of a good many English ships at *H.* Life insurance is not prosecuted in Germany to any considerable extent.

Bankruptcy. Considering the vast number of merchants and tradespeople at *H.*, bankruptcy is not, in general, of frequent occurrence. Much of the business transacted at *H* being on commission and for account of houses abroad, the failure of foreign merchants is a prevalent source of bankruptcy. Another source of bankruptcy is losses on goods imported or exported on speculation, and occasionally losses in the funds, in which a good deal of gambling goes on here. Expensive living is not nearly so prevalent a source of bankruptcy here as in New York, London, and other places.

Navigation of the Elbe, and Pilotage. The mouth of the Elbe is encumbered with sand-banks. The channel leading to Cuxhaven is bounded on the N by the Vogel Sands and North Grounds, and on the S. by the Schaarhorn Sands and Neuwerk Island On the latter there are 2 light-houses and 2 beacons, and on the Schaarhorn is another beacon. The light-houses on Neuwerk Island are about 700 yards apart; the most southerly, which is also the most elevated, being in lat. 53° 54′ 57″ N., lon. 8° 29′ 40″ E. It is 128 feet high, being twice the height of the other. The channel is, in some places, hardly ¾ of a m. wide. The outer red buoy in the middle of the channel at its mouth bears from Heligoland S. E by S., distant nearly 20 m. But the best mark in entering the Elbe is the floating light, or signal ship, moored 2 m. N. W. by N of the red buoy, in 11 fathoms at low water. This vessel never leaves her station unless compelled by ice in winter. By night she exhibits a lantern light, 38 feet above deck, and in foggy weather rings a bell every quarter of an hour. A second signal ship is stationed 5½ m. S. E. by E. from the first, at the westernmost point of a sand-bank dividing the fair way of the river. She is rigged like a galliot, to distinguish her by day from the first signal ship; and during night she exhibits *two* lights, one 18 feet above the other. The distance from the outer red buoy to Cuxhaven is about 16 m; thence to Glückstadt the course is E., 28 m.; from the latter to Stade the course is southeasterly, 9 m.; and then easterly to *H.*, 18 m. The channel throughout is marked with black and white buoys, which are numbered and specified in the charts. The black ones are to be left, in passing up the river, on the starboard, or right-hand side, and the white on the larboard side — All vessels coming from sea into the Elbe, which measure above 60 commerce lasts at 6,000 lbs. each, must pay pilotage whether they require a pilot or not: and however well the signals, lights, beacons, and buoys may be arranged, the services of an experienced pilot are very necessary, especially in the case of fogs or stormy weather. To assist in getting vessels supplied with this indispensable functionary, a schooner was directed in 1855, to cruise between Heligoland and the mouth of the river, to be in readiness to supply ships with pilots and instructions; and this plan having been found to answer extremely well, a second schooner has since been employed for the same purpose. Previously to this arrangement vessels had to heave to by the pilot-galliot, moored near the river's mouth;

and when, owing to the state of the tide or the weather, they could not do this, they had to sail to Cuxhaven and there get a pilot. But the schooners being extremely good sea-boats, and always on the lookout, their employment has greatly reduced the inconveniences that formerly attended the shipping of pilots. The charges on account of pilotage vary, of course, with the vessel's draught of water, the distance she has been piloted, and sometimes also with the nature of the cargo. They are in all cases very moderate. The charge for towage is fixed per agreement.

Hamburg Blue. See BICE.

Hamburg Lake, a cochineal lake color, rather purplish, or inclining to crimson.

Hame, one of the pair of lyre-shaped pieces of wood or metal inserted into the groove of a horse's collar, to which the traces of the harness are fastened.

Hameçon [Fr.], a fish-hook.

Hamilton, a fire-insurance Co., located in New York City, organized in 1852. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $150,000; net surplus, $124,536.95; risks in force, $10,268,253; premiums, $56,188.13; premiums received since the organization of the Co., $1,700,530.90; losses paid, $761,718.75; cash dividends paid to stockholders, $384,750.

Hammer, a tool used by mechanics, which consists of an iron head fixed crosswise upon a handle. The *H.*, however, employed in the useful arts vary greatly in form, and the weights of individual examples may be estimated from several tons to the fraction of an ounce. The *H.* used by blacksmiths are of several kinds. Among others are the *about-sledge*, which is the largest of all, and is held by both hands at the furthest end of the handle, and being swung at arm's length above the head, is made to fall heavily upon the work. The

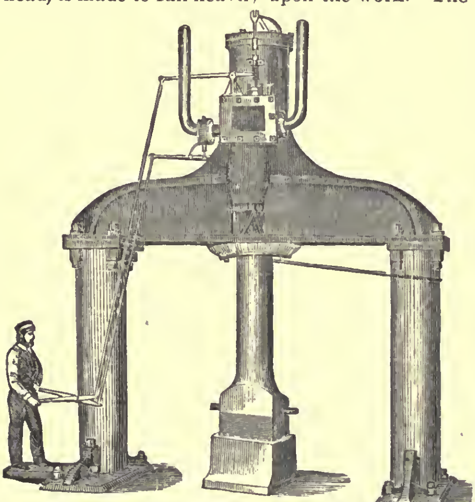

Fig. 257. — HIGH-FRAME STEAM-HAMMER.

up-hand sledge is not so large, but is used with both hands, and seldom raised above the head. The *hand-H.* is the smallest, and may be used with one hand at the anvil. The class of *H.* called *riveting-H.* have the handle fixed to them by passing it through a hole in the head, where it is made to fit or be wedged firmly; the face is formed of steel, as well as the riveting end, and welded to the iron. These *H.* are used by carpenters, smiths, engineers, and numerous artisans, varying in size and form according to the purpose for which they are required. A variety of *H.* having two claws, called *claw-H.*, are much used by carpenters and other mechanics, as the claw, together with the handle, forms a powerful lever for drawing out nails, etc. The largest *H.* are those used in the manufacture of iron. In this form they are not mere tools, but machines moved by steam or some other power. There are many varieties. *Froming's forge-H.*, which is used for heavy castings, as well as for edge-tools, knives, files, etc., may be moved either by hand, water, or steam power. A heavy hammer-head, with a guide-rod, cones, and vertical spring, accomplishes the work by means of a driving shaft made to rotate by any source of power. In *Hutton's power-H.* the weight is raised by a strap or chain, attached to a drum or pulley on an axis; when the blow is struck, the momentum is made to assist in raising the *H.* again. This *H.* is much used in beating iron and steel between pairs of dies. The *frictional-action-H.* can be worked by any continuously revolving power-shaft, and can be made to hammer 150 blows per minute with a very heavy hammer-head. *Cotton's air-tilt-H.* and *Waterhouse's compressed-air forge-H.*, for light work in a smith's shop, are also useful varieties; and there are many more. The powerful machine called the *steam-H.* was originally invented by Mr. Nasmyth, in 1842. In its latest developments this is certainly one of the most important machines known to the mechanical engineer. As usually constructed, there is a mass of iron called the *H.-block*, weighing sometimes several tons; and a smaller mass fixed to the lower part of it constituting the *H.* This *H.* works upon an *anvil*, embedded in the upper surface of a ponderous mass called the *anvil-block*, so supported by a solid foundation as to be able to bear almost any amount of concussion. Rising from the ground are two *standards*, so arranged as to retain the moving part of the mechanism between them; these standards are joined at the top by a *lintel* (Fig. 257). A small *steam-engine* is upheld mainly by the lintel, with steam-cylinder, valve-box, piston-rod, steam-chest, and other accessories, all specially adapted to this kind of work. The steam-boiler may be at any convenient distance, and steam brought from it through a jacketed steam-pipe. The arrangement is such that, when steam enters the cylinder below the piston, the piston is driven up, and drags up with it the *H.*-rod, *H.*-block, and *H.*; when the steam escapes through a valve to the waste-pipe, the *H.* and its appendages fall with tremendous force by their sheer weight. There is self-acting gear, which arrests the rise of the piston at any required height, thereby giving to the *H.* any desired depth of fall. When once adjusted the *H.* will continue its lusty blows with uniform power; a slight change made by an attendant will vary either the rapidity of the blows or height of the descent, or both, and another slight movement will stop the action altogether. All the detailed mechanism which enables one single workman to do this is exceedingly beautiful, especially that in which some of the steam is made to act as an elastic cushion or spring. We have seen the same steam-*H.* crush an iron bar an inch thick, and then, by a simple movement of a handle, give taps so gentle as to descend upon a nut without cracking the shell. The first steam-*H.* that were made had *H.*-blocks of about $1\frac{1}{2}$ cwt. each; but the machine has since been vastly increased in weight and power, insomuch that there are now examples varying from 2 cwt. to 20 or 30 tons. At Krupp's celebrated steel-works at Essen, in Prussia, there is one steam-*H.* said to be 50 tons in weight, with a cylinder 6 feet in diameter; the blows which it

hurls are received upon an anvil weighing no less than 185 tons. There are nearly 50 steam-*H.* of various sizes at these gigantic works. A *duplex* steam-*H.* has been invented, and partially brought into use, having two horizontal cylinders, and two *H.* which approach each other horizontally, squeezing and thumping any object (such as a mass of red-hot iron) that comes between them.

Hammer-Axe, a double tool, having a hammer at one side of the handle and an axe at the other.

Hammer-Beam, a tie-beam.

Hammer-Cap, a cover for the cock of a gun.

Hammer-Cloth, an ornamental covering to the coachman's seat, principally used for the more elegant kinds of coaches.

Hammerer, a blacksmith; a worker on metal at an anvil.

Hammer-Head, the solid shaped piece of iron which is fitted to a handle for striking with, and which is sent in large quantities, or strings, packed in casks, to different ports.

Hammer-Helve, the shank of a forge or trip-hammer.

Hammerman, a name in Scotland for a smith.

Hammer-rail Maker, a manufacturer of parts of the machinery for a piano-forte.

Hammock, Hamac, a kind of hanging bed, which is suspended between trees or posts, or two hooks. The true Indian *H.* is a long narrow net made of strong cord, and terminated at each end by small ropes for suspending it. The *H.* used on board ship consists of a piece of stout canvas, about six feet long and three broad, gathered at the ends and suspended by cords. The sailor's *H.* is an oblong piece of hempen cloth; at each end are fastened several small lines, meeting in a grummet or iron ring: these form the *clews*. The whole, having mattresses, pillows, etc., placed in it, is hoisted up into its place by small ropes called *laniards*, between two battens or screws in the beams of the deck overhead, about nine feet distant asunder. The *H.* is a very agreeable bed, especially in cold weather; but some little practice is requisite at first in getting in and out successfully. During the day the *H.*, lashed up tight in the form of caterpillars, are stowed in the nettings along the upper edge of the bulwark.

Hamper, a large wicker-work covered basket.

Hampton Roads, a branch of Chesapeake Bay, off the mouth of James River, between Old Point Comfort on the N. and Willoughby Point on the S., Virginia. It is sufficiently deep for the largest ships of war, and is an important naval rendezvous. On Old Point Comfort is Fort Monroe, and on the opposite point, one mile distant, is Fort Calhoun, which completely command the entrance to Hampton Roads. On the N. side of the entrance is *Old Point Comfort Light*, lat. 37° 6′, lon. 79° 18′ W., showing a fixed light on a white tower, and elevated 40 feet above the surface of the sea. On the south side of the entrance the *Willoughby Spit Light Vessel* shows fixed lights, elevated, the one 32 and the other 41 feet above the sea-level; and here is a fog-bell also. The channel leading from the Capes of Virginia to Hampton Roads is reduced at *Old Point Comfort* to a narrow width. The shoal water, under the action of the sea and the reaction of the bar, is kept in an unremitting ripple; which circumstance has given to this place the name of the *Rip Raps*.

Hamster, a small rodent animal, the *Cricetus frumentarius*, the fur of which is used for many purposes. The animal is very plentiful in Germany.

Han, a caravansary or inn in the Levant.

Hand, the palm. — A measure of four inches used for ascertaining the height of horses. — The index finger of a watch, clock, or counter. — A set of cards. — A workman. — The form of writing or penmanship. — A bundle or head of tobacco-leaves tied together without the stem being stripped.

Hand-Ball, a small stuffed ball for children's amusement.

Hand-Barrow, a frame or tray, with handles at each end, carried between two persons.

Hand-Basket, a portable basket with handle.

Hand-Bell, a small portable sounding instrument, rung by the hand, often kept on a table for summoning servants.

Handbill, a chopper or pruning-hook. — A small printed sheet distributed by hand to persons, or delivered from house to house.

Hand-Book, a manual of reference.

Hand-Brace, an instrument to hold a boring tool.

Hand-Breadth, the palm; the size of the hand; a measure of 3 inches.

Hand-Bucket, a small leather bucket or wooden pail that is easily lifted.

Hand-Churn, a box for making butter, worked by the hand.

Hand-Crank, a crank turned by the hand.

Handcuffs, iron shackles or manacles for the wrist.

Hand-Fork, a prong; an agricultural implement.

Handful, a small quantity of anything; as much as can be grasped in the hand.

Hand-Gallop, an easy pace of a horse.

Hand-Gear, the contrivances for working steam-engine valves.

Handglass, a small glazed frame for sheltering and forwarding out-door plants.

Hand-Grenade, a grenade to be thrown by the hand.

Hand-Guide, an instrument for insuring to the player a good position of the hands and arms on the piano-forte.

Hand-Hammer, a workman's tool; a small, light hammer. See Hammer.

Hand-Hook, a bent instrument used by smiths in twisting square iron.

Handicap, a weight-for-age race for horses.

Handicraftsman, a mechanic or artificer; an artisan or hand-worker.

Handiness, neatness, skill, dexterity.

Hand-Kase, a kind of cheese made in Germany from sour milk.

Handkerchief, a silk, cotton, or linen cloth, usually square, varying from 8 to 22 inches in size, and used to wipe the face. — A piece of cloth worn about the neck; a neckerchief.

Handle, the haft; the part of anything taken in the hand, by which it is used or lifted, as of a saucepan, a knife, a sword, etc. See Haft.

Hand-Lead, a small lead fastened to a line, used for sounding in rivers and harbors, or for ascertaining the depth of wells, etc.

Hand-Light, a portable lantern; a blue light.

Hand-Line, a small fishing-line.

Hand-Mallet, a wooden hammer or beater.

Handmill, a quern; a small iron mill for grinding grain, pepper, coffee, or other articles, worked by the hand.

Hand-Money, earnest-money, the money paid

at the closing of a contract of sale by the purchaser.

Hand-Plane, a carpenter's smoothing or facing plane.

Hand-Rail, a leaning support in a ship. — A stair rail supported by balusters.

Hands, a sea-term for the sailors or available force of a ship; factory workmen; dock-laborers, etc.

Handsaw, the largest saw used by hand.

Hand-Screen, an ornamental screen for keeping off the heat of the fire.

Hand-Screw, a jack or engine for raising heavy timbers or weights.

Handsel, an earnest-money paid to close a bargain. See EARNEST.

Handsomely, in nautical language, dexterously, slowly, carefully.

Handspike, a long wooden bar used for turning a windlass, etc.

Hand-Staff, a stout walking-stick. — The upper or holding part of a flail.

Hand-Vice, a small portable vice.

Hand-Work, work effected exclusively by the hands, without the intervention of machinery.

Handwriting, the cast or form of writing peculiar to a person.

Handy-Billy, a watch-tackle in a ship.

Hangar [Fr.], a shed; a cart-house; coach-house.

Hanger, a seaman's cutlass, a short round curved sword. — That by which a thing is suspended.

Hanger-On, a miner employed at the bottom of the shaft, in fixing the skip or bucket to the chain.

Hangings, tapestry or curtains; room-papers.

Hanging-Shelf, a suspended shelf in a pantry or room, to avoid rats.

Hanging-Sleeves, large loose sleeves to a lady's dress.

Hang-Net, a net with a large mesh.

Hank, a coil. — A skein or head of thread, silk, or cotton, etc.; two or more threads twisted and tied together; a yarn-measure which, for cotton yarn, consists of 7 leas or 480 yards; for worsted yarn the leas are longer, making the length of the hank 560 yards. — One of the rings or hoops of wood, rope, or iron round a stay in a ship, to secure a sail to.

Hankow. See CHINA (Seaports).

Hannibal and Naples R.R. runs from Naples, Ill., to Hannibal, Mo., 49.6 m. This Co., whose offices are in Springfield, Ill., was chartered in 1863, and the road opened in 1870. The Wabash R. R. Co. leases and operates it. *Financial statement:* Cap. stock, authorized $750,000, paid in $457,000; funded debt, $700,000, as follows, — 1st mortgage 7 % bonds, issued 1868, $675,000, payable 1888 (interest May and Dec.), and 2d mortgage 7 % bonds, issued 1870, $225,000, payable 1890.

Hannibal and St. Joseph R.R. runs from Hannibal to St. Joseph, Mo., 206.41 m., with branches from Cameron to Kansas City, Mo., 53.05 m.; from St. Joseph, Mo., to Atchison, Kans., 19.47 m.; and from Palmyra, Mo., to Quincy, Ill., 13.42 m.; making a total of 292.35 m. owned and operated by the Co. This Co., whose offices are in Hannibal, was chartered in 1847 and opened its main road in 1859. It has received a land-grant by act of Congress, and loans amounting to $3,000,000 from the State of Missouri. The bridge over the Missouri River, at Kansas City, is the property of this Co., which allows its use under contract by the St. Louis, Kansas City, and Northern R. R. Co., and the Kansas City, St. Joseph, and Council Bluffs R.R. Co. *Financial statement:* Cap. stock, common, $9,168,700, and preferred, $5,083,024, total $14,251,724; funded debt, $8,633,000, as follows,—Convertible mortgage 8 % bonds, 15-year bonds, payable 1885, $4,000,000; Missouri State loan, 6 % bonds renewed, $3,000,000, of which $500,000 are payable in 1886, $1,000,000 in 1887, and $1,500,000 in 1894; 2d mortgage (Quincy and Palmyra) 8 % 30-year bonds, payable 1892, $433,000; 1st mortgage (Kansas City and Cameron) 10 % 30-year bonds, payable 1892, $1,200,000. There is besides a land-grant mortgage secured on the Co.'s land-grant contracts assigned to the Farmers' Loan and Trust Co. in 1878. These bonds, of which the amount of $1,000,000 was authorized and $532,000 sold, are payable in 1888, interest 7 %. These bonds are to be cancelled by successive drawings of $25,000 each, of which 6 have already taken place, leaving $850,000 uncancelled. There are still about 90,000 acres of unsold land.

Hanover, a former kingdom of Germany, now annexed to Prussia. See PRUSSIA.

Hanover, a fire-insurance Co. located in New York City, organized in 1852. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $500,000; net surplus, $675,898.84; risks in force, $84,791,280; premiums, $842,064.32; premiums received since the organization of the Co., $9,476,468.33; losses paid, $4,923,791.99; cash dividends paid to stockholders, $884,500.

Hanse Towns, a name given to certain towns situated in the N. of Europe, which formed in the 13th century an association called the *Hanseatic League*, having for its object the protection of mercantile property. It was so called from an old German word signifying union. The first point with the confederates was to repress the seizure of merchant vessels by pirates, and the robbery of goods conveyed by land; the next was to obtain justice in regard to the claims of merchants in courts of law, — a matter of no small difficulty in those rude times. The town which took the lead in forming this association was Lubeck, the trade of which had become considerable in the 13th century, chiefly from its position. Situated at the S. E. point of the Baltic, it was the natural entrepôt for the trade of Prussia, Poland, and Livonia with the N. W. of Germany, in the same manner as Hamburg, from its ready access to the North Sea, was the fit port for communicating with the Netherlands and England. The distance between these towns by land being small (only 40 m.), frequent conferences took place in regard to their mutual interests; and the result was their concluding a treaty in the year 1241, by which they bound themselves to use their utmost efforts for the protection of trade. Brunswick, then the chief inland town in the N. W. of Germany, and connected in trade with both Lubeck and Hamburg, acceded to the treaty shortly afterwards; and in 1252 deputies from each of the three met at Lubeck, where, among other arrangements of importance, they took steps for establishing factories in London, Bruges, and Novgorod in Russia. Being open to new members, they were joined in the course of the next century by a number of cities, such as Amsterdam and other ports in the Netherlands, Dantzic, as well for itself as for the lesser towns in the N. of Poland, and Cologne, for the different trading places on the Rhine. The confederacy attained its greatest power in the 15th and 16th centuries, when the league comprised no

fewer than 64 commercial places; and was capable of conducting extensive naval operations, and of asserting its rights by force of arms. As civilization diffused itself, however, in the N. of Europe, and the different governments made a point of protecting trade as well by sea as in their respective territories, less exertion was required on the part of the Hanse Towns. It became evident, also, from the example of Holland, that trade prospered most when each mercantile district or seaport was left to manage its own concerns. Hence a gradual relaxation in the bonds of the confederacy, so that Lubeck, Hamburg, and Bremen are all that continue to acknowledge the authority of the League. To this day they preserve the shadow of its power, being still acknowledged as free Hanseatic cities. But their enforced embodiment since 1872 in the German Empire, and association with the other German States in the Zollverein, will cause even this shadow to lessen very rapidly. The high court of appeal for the three Hanse Towns, reorganized by treaty of Nov. 30, 1866, after the incorporation of Frankfort-on-the-Main with Prussia, is established at Lubeck. It is composed at present, under a convention signed July 2, 1872, of a President, nominated by the Senates of the three Free Cities, and 6 councillors, 3 of whom are chosen by Hamburg, 2 by Bremen, and 1 by Lubeck. The supervision of the Court is in the Senate of the three cities, passing in rotation from one to the other on the 22d of July of every year.

Hansom Cab. See CAB.

Haou, a name in China for the tenth part of a dollar.

Hapse. See HASP.

Harbaia, a measure of capacity, used in Tripoli and other parts of Northern Africa, equal to about 20¼ lbs.

Harbor, a technical name, in the glass-trade for a chest 6 or 7 feet long to hold the mixed ingredients previous to being put in the pot for fusion.

Harbor, Haven, or **Port**, a piece of water communicating with the sea, or with a navigable river or lake, having depth sufficient to float ships of considerable burden, where there is convenient anchorage, and where ships may lie, load, and unload, screened from the winds, and without the reach of the tide. There is every variety in the form and quality of harbors. They are either natural or artificial; but, however formed, a good harbor should have sufficient depth of water to admit the largest ships at all times of the tide; it should be easy of access, without having too wide an entrance; the bottom should be clean and good; and ships should be able to lie close alongside quays or piers, that the expense and inconvenience of loading and unloading by means of lighters may be avoided. Ships lying in a harbor that is land-locked, and surrounded by high grounds or buildings, are at once without the reach of storms, tides, and currents, and may in most cases be easily protected from hostile attacks. Bar harbors are those that have bars or banks at their entrances, and do not, therefore, admit of the ingress or egress of large ships except at high water. These are most commonly river harbors; the sand and mud brought down by the stream, and driven back by the waves, naturally forming a bar or bank at their mouths. The reader will find all the harbors of any importance in the U. States, and the principal foreign commercial harbors, described in this work under their respective titles, or the names of the states or countries to which they belong.

Number of Harbors on the Coast of the U. States, and the principal ones on Rivers to the Head of Tide.

Maine	52	Virginia	22
New Hampshire	3	North Carolina	52
Massachusetts	51	South Carolina	21
Rhode Island	7	Georgia	15
Connecticut	32	Florida	66
New York	27	Alabama	4
New Jersey	14	Mississippi	10
Pennsylvania	3	Louisiana	33
Delaware	3	Texas	12
Maryland	11	Total	438

Harbor-Dues, the charges made to ships for using a harbor and moorings, etc.

Harbor-Light, a light to guide ships on entering a harbor.

Harbor-Master, the officer in charge of a port who has the superintendence of the shipping.

Hardbake, a kind of sweetmeat of baked sugar, sometimes with blanched almonds.

Hardener, one who brings tools down to the proper temper.

Hardes [Fr.], clothes, luggage, apparel.

Hardness, compactness; solidity; the power of resisting abrasion. Mineral substances are frequently distinguished and identified by their relative hardness. The method pursued in constructing the following and similar tables of the hardness of different substances is by observing the order in which the articles tried are capable of cutting or scratching one another.

Table of the Ratio of Hardness of Gems and other Bodies.

Substances.	Hardness.	Specific Gravity.
Diamond from Ormuz	20	3.7
Pink diamond	19	3.4
Bluish diamond	19	3.3
Yellowish diamond	19	3.3
Cubic diamond	18	3.2
Ruby	17	4.2
Pale ruby, from Brazil	16	3.5
Deep blue sapphire	16	3.8
Paler sapphire	17	3.8
Topaz	15	4.2
Whitish topaz	14	3.5
Ruby spinell	13	3.4
Bohemian topaz	11	2.8
Emerald	12	2.8
Garnet	12	4.4
Agate	12	2.6
Onyx	12	2.6
Sardonyx	12	2.6
Occidental amethyst	11	2.7
Crystal	11	2.6
Cornelian	11	2.7
Green jasper	11	2.7
Reddish yellow jasper	9	2.6
Schoerl	10	3.6
Tourmaline	10	3.0
Quartz	10	2.7
Opal	10	2.6
Chrysolite	10	3.7
Zeolite	8	2.1
Fluor	7	3.5
Calcareous spar	6	2.7
Gypsum	5	2.3
Chalk	3	2.7

Hard-Roe, a female fish, or spawner.

Hardware [Fr. *quincaillerie;* Ger. *kurze Waaren;* It. *chincaglio;* Port. *quincalharia;* Sp. *quinquilleria*], a general term for goods manufactured from the commoner or more useful metals; that is, iron and steel, brass and copper, zinc and tin. It is not easy to name the limit to which this trade extends, owing to the multiplicity of articles to which the name *H.* is given. It extends occasionally to certain commoner kinds of plated goods, but does

not include machinery, agricultural implements, and cutlery, though articles belonging to the two last-named departments of trade are commonly sold in *H.* stores.

Hard-Wood, a name applied to heavy, close-grained-woods, chiefly used by cabinet-makers and turners; among *H.-W* belonging to the U. States are walnut, white oak, chestnut, wild cherry, ash, hickory, maple, cedar, locust, etc. In America, the term *H.-W.* is frequently applied commercially to other woods than firs, pines, or spruce.

Hare, a rodent animal, which is hunted and shot for its flesh and for its skin. See FUR.

Haricot, French or kidney bean.

Harina, the Spanish word for flour.

Harkem, a Belgian rake or harrow.

Harle, the reed or brittle stem of flax, separated from the filament.

Harlem Extension R.R., South, runs from Chatham Four Corners, N. Y., to Bennington, Vt., 58 m. This Co., whose offices are in New York, is the N. Y. portion of the line formed in 1870 by the consolidation of the Lebanon Springs and the Bennington and Rutland R.R. Cos., and which was taken possession of in 1876, by trustees under foreclosure. It has since been operated, under lease, under the name of Harlem Extension R.R. South Coal Transportation Co. *Financial statement* previous to the separation of the two roads: Cap. stock, $4,000,000; funded debt, $4,000,000, consisting of 1st mortgage 7 % bonds issued in 1870 and payable in 1890.

Harlem River and Port Chester R.R. runs from the Harlem River to New Rochelle, N. Y., 11.80 m., and has its offices in New York City. The original Co., which was chartered in 1866, became embarrassed, and the road was completed by the New York, New Haven, and Hartford R.R. Co., who made it a branch of their own line, leasing it at the rate of the interest on the bonds, $130,000 per annum. *Financial statement:* Cap. stock, $42,160; funded debt, 1st mortgage 6 and 7 % guaranteed bonds issued in 1873, payable in 1903, $2,000,000.

Harmonica, Musical Glasses, a musical instrument in which the sounds are produced from glasses blown as nearly hemispherical as possible, each having an open neck or socket in the middle into which a perforated cork is fitted.

Near the brim the glass is about one tenth of an inch thick, but increases towards the neck, which is in the largest about one inch deep and half an inch wide within, the dimensions lessening in proportion as the glasses diminish in size, all excepting the smallest, which ought not to be less than half an inch in length. The largest glass is nine inches in diameter, and the smallest three; between these there are twenty-three different sizes. They are distinguished by painting the apparent parts of the glasses on the inside — every semitone white, and the other notes of the octave with the seven prismatic colors, so that glasses of the same color, white ones excepted, are always octaves to each other. The glasses are placed on a round iron spindle (fixed horizontally in the middle of a box, and made to turn on brass gudgeons at each end), one within the other, each leaving about an inch of its brim above that of the other. The spindle is turned by means of a foot-wheel, and the tones produced by rubbing the exposed parts of the glasses with the ends of the fingers damped and rubbed with chalk to bring out the tone more readily. The glasses also should be occasionally wetted with a sponge and clean water. The production of the sound by means of the naked finger is said to have such an effect upon the nervous system as in some cases to have caused fainting-fits. Many attempts were made to play it by keys, but none have succeeded, no dead substance having been yet found capable of giving the same expression to the sound as the human fingers.

Harmonicon, a musical instrument, whence the sound is obtained by striking with a cork on pieces of glass, or on metallic plates, loosely suspended. It is a popular and cheap toy, largely imported from Germany.

Harmonimeter, an instrument for ascertaining the harmonic relation of sounds.

Harmoniphon, a small musical instrument with a key-board, in which the sounds are produced from small metal tongues, acted upon by blowing through a flexible tube.

Harmonium, Melodeon, Seraphine, a musical instrument which bears some affinity to the organ, but, unlike that instrument, is made upon a principle technically termed the *free vibrating reed*, which is said to have been known from an early period in China, but was invented by Grenié in 1810, and first described by Biot in 1817.

The free reed consists of a brass plate containing an oblong slit, having a thin elastic tongue fixed to one end in such a manner, and so exactly fitting into the slit, as to completely close it, but so that it will, upon the pressure of the wind on the free end, pass either inwards or outwards, without touching the end or sides. It has several advantages over the beating-reed of the organ. In the first place, its tone is of a more agreeable quality; secondly, it requires no pipe, which is an indispensable addition to the organ; thirdly, it is much less liable to get out of order; and fourthly, it gives an entirely new property, — *viz.* the power of *expression* Debain, of Paris, was the first to construct a keyed instrument upon the free-reed principle of a really useful character. Several attempts had been made, but all had more or less failed, until Debain invented the harmonium. This instrument is about 3 feet high by 3 feet 9 inches broad, its depth varying according to the number of stops. The key-board is immediately below the lid, and its compass extends five octaves, from C to C. This now, however, in the best instruments, is virtually converted into seven by the more perfect arrangement of the stops. The valves are beneath the key-board and on top of the wind-box, within which are the different rows of reeds, the pitch of which is regulated by their size, which varies from half an inch to 3½ inches in length, whilst the quality of the sound is modified by the breadth of the vibrating portion and the shape of the hole covered by the valve. The wind is supplied by means of bellows with two feeders, which the player moves alternately with his feet. For the deep bass notes the springs are heavily loaded at the loose end, to make them vibrate slowly; while for the higher notes they are made thinner at that end. Some harmoniums have only one row of reeds, others four; some also have two rows of keys. Lately a "knee movement" has been introduced, by which a small degree of crescendo may be produced on either bass or treble.

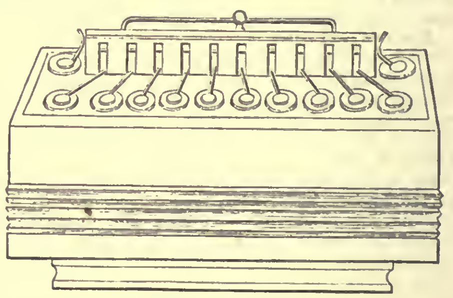

Fig 258. — ACCORDION.

The *accordion*, or *accordeon*, is a musical instrument which differs from the harmonium in size and the mode of manipulation, but is constructed on the same principle. It consists (Fig. 258) of a small oblong box, of from 8 to 20 inches in length, with an inside row of small elastic springs, or laminæ, fixed in a metallic plate at one end in such a manner as to allow them to vibrate freely. A bellows, or folding apparatus, unites the upper and lower parts, and supplies the springs with the necessary air to put them in motion. To these the air is admitted by valves, which, in the same manner as in an organ, are acted on by the keys. A bass note, or drone, is also added. The compass of the most perfect instrument is from G, the fourth space on the bass cleff, to E, the seventh additional space above the treble, all the semitones inclusive. See ORCHESTRON.

Harness, the gear and trappings for a carriage or draught horse, including all that is placed on the horse when at work, and by which the animal is attached to the carriage. See SADDLERY. — The contrivance in a loom by which the sets of warp-threads are shifted alternately to form the shed. See LOOM.

Harness-Cask, a cask or high tub with a lid guarded by a rim which comes a small way down the cask; used on board ship for keeping salted meats ready at hand for daily use.

Harness-Clamp, a kind of vice having a pair of jaws closed by a spring, wedge, or screw, and used by saddlers to hold leather while being stitched.

Harness-Pad, a lining or soft wad beneath a saddle, to keep the harder portions from galling the back of the horse.

Harness-Plate, the plated bits, buckles, rings, etc., on harness.

Harness-Saddle, that part of the harness resting across the back, and to which the girthing portions are attached.

Harness-Smith, a metal-worker who forms the iron-work for saddlery.

Fig. 259. — EGYPTIAN HARP
(*From a painting at Thebes.*)

Harp [Fr. *harpe*: Ger. *Harfe*], a well-known musical instrument of great antiquity, and which, in biblical and heathen records, holds a most exalted rank. To attempt giving exact information on its origin would be a task impossible to accomplish, as it seems lost in the darkness of ages. Moses tells us that Jubal, the son of Lamech the first, was "the father of all such as handle the *H.* and the organ." The *H.* soothed the frenzied soul of the lion-hearted king of the Jews, when played by David, the young poet-harpist of Israel; and the sight of the *H.*, which the stricken Hebrews had carried from the falling towers of Jerusalem, consoled their exile while they hung the beloved instruments, which they were not allowed to play, upon the willows as they sat down in their desolation by the waters of Babylon. Among the Greeks, Mercury was "the sweet parent of the bending lyre," and no epithet more chaste and beautiful has been applied to the land of Homer, than "the land of lyres." But monuments have outlived history. Bruce discovered frescos of the harp near the ruins of Thebes, believed to have been executed under Sesostris, at least 14 centuries before Christ. These harps (Fig. 259) so closely resemble the modern, that at a glance they might be taken for those of our own times. The harp was used as an accompaniment in singing their Psalms by the congregations of the early Christians. It waked the echoes of the old Welsh mountains while the white-haired bards rehearsed the history of their nation in verse. It led the festivities of every palace, and lent its charms to every lady's boudoir or troubadour's song of love. It sent its soft murmurs through the lofty arches of the stately cathedrals of the Middle Ages, and is the only instrument which links the melody of earth with the songs of heaven. The Welsh harp was strung with gut, while the Irish harp (Fig. 260) was strung with wire. The harp, that favorite instrument of all nations, was much improved during the last century, but it was reserved to the genius and perseverance of Sebastian Erard, a celebrated piano-maker of Paris, to produce a harp, which, while fulfilling the high expectations of the musical world, attracted general notice by its commanding form, exquisite workmanship, and the chasteness and richnesss of its classical ornaments. This noble instrument was completed in 1810, and called Erard's Double-Action Harp, on account of its two mechanisms working together. It is tuned in the key of C flat. By fixing the pedals in the first groove the instrument is at once transposed into C natural; and by fixing them in the second groove, it is transposed another semitone higher, into the key of C sharp; the compass of the harp being thus from the double E below the bass to E in altissimo. Since this time there has been no more improvement in the harp than there has been in the violin since Stradivarius. Erard of Paris and London, and Browne of New York (Geo. H. Buckwell successor), are the two best harp-makers in the world; and according to Bochsa, Aptommas, and other great masters of the harp in Europe, no European harp can give more complete satisfaction than Browne's splendid grand Gothic six octave and a half double-action, with the vibrating basses (Fig. 261). The harp has long been neglected for its noisy rival, the piano,

Fig. 260 — IRISH HARP OF THE ELEVENTH CENTURY.
(*College Museum, Dublin.*)

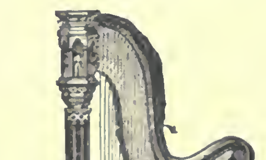

Fig. 261. — BROWNE'S AMERICAN HARP.

but it is remarkable that for the last ten years there is so marked revival of this beautiful instrument, that it is now seen in every music-store, and heard in all the fashionable houses. As an orchestral instrument it can no longer be dispensed with, for, beginning with Spontini in his famous opera, *The Vestal*, and Rossini in *William Tell*, it fills in the music of all great modern composers a place which nothing else can supplement. It does for a hundred other pieces what twilight does for scenery. While it blends harmoniously with all other instruments and voices, as the aroma of a flower-garden pervades the all-surrounding air, it never loses its own individuality. With the least noise, it sends forth the most melody. The highest and purest sphere of the harp, however, is in the drawing-room, where the beauty and association of its classic form, the living sympathy with which its tender and passionate vibrations blend with the female voice in its illimitable realm of song, have in all ages made it the mightiest ally of woman. The harp is a magical former of the voice. It softens all its tones, it refines all its modulations; even the simplest accompaniment on this melodious instrument gives a charm and training to the voice to which the piano is an utter stranger.

Harper, Harpist, a player on the harps.

Harpings, in ship-building, are those planks or wales, forming the outer skin of a ship, which bend in towards the bow, and are fastened in the stern; they hold the timbers of the fore-and-aft cant-bodies till the ship is planked. They are made thicker than other parts of the wales, to encounter the great resistance offered by the water as the ship cuts through it. — *Cat-harpings* are minor ropes between the tops and mastheads, employed to draw the shrouds together and inwards towards the mast. They serve to tighten the shrouds, and to give freer play to the yards and sails when braced for on either tack.

Harplings, twisted gut-strings for harps.

Harpoon, Harping-Iron, an iron spear or javelin, shaped like a barbed arrow at one end, with a ring at the other through which a rope is run; used for the purpose of spearing whales (Fig. 262) in the Greenland and other whale fisheries. The *gun-harpoon* is a weapon used for the same purpose but which is discharged from a swivel or gun, instead of being thrown by hand. This weapon is formed entirely of metal, and has a chain attached to it, to which the usual line is joined on, as in the former case. See WHALE-FISHERY.

Harpooner, the seaman in a whale-boat who uses the harpoon.

Harpsichord. See PIANO-FORTE.

Harra, a weight of Surat, about 787½ lbs. avoirdupois.

Harrier, a small hound for coursing hares.

Harrisburg. See PENNSYLVANIA.

Harrisburg and Potomac R.R. runs from Bowmansdale to Jacksonville, Pa., 25.13 m., with a branch to Philadelphia and Reading Coal and Iron Co.'s mines, 2 m. This Co., whose offices are at Boiling Springs, Pa., was chartered in 1870 and reorganized in 1871. The road was completed in 1878. It is proposed to extend the line from Harrisburg to Waynesboro', a distance of 60 m., and from the main line to Kettlestown, 30 m., with several branches. *Financial statement:* Cap. stock, $379,165.20; funded debt, $507,200, consisting of 1st mortgage 7 % 30-year bonds payable 1904.

Harrisburg, Portsmouth, Mount Joy, and Lancaster R.R. runs from Dillerville to Harrisburg, Pa., 35.54 m., with branch from Middletown to Columbia, Pa., 18.13 m.; total, 53.67 m. This Co., whose offices are in Philadelphia, was chartered in 1832, and leased in 1860 to the Pennsylvania R.R. Co. for 999 years, the lessees to pay all expenses, interest on the funded debt, and 7 % on the cap. stock. *Financial statement:* Cap. stock, $1,182,550; funded debt, $700,000, consisting of 1st mortgage 7 % 30-year bonds payable 1883.

Harrow, an agricultural implement, made in various shapes, but which, in its simplest form, consists of bars of wood or iron, fastened together transversely, either at right angles to each other or diagonally, with iron teeth projecting downwards from the points of intersection perpendicularly, or with a slight inclination. A *H.* with the bars set diagonally is the best, as their inclination to each other may be regulated in such a manner

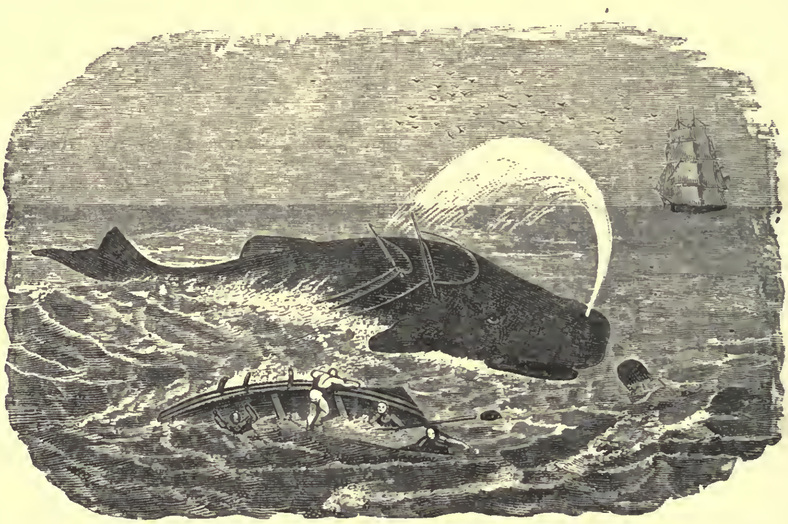

Fig. 262. — HARPOONING A WHALE.

that each tooth marks out a separate furrow; in consequence of which the implement performs its work more effectually than it would if the bars were disposed, as in the old *H.*, at right angles to each other. There is also an expanding harrow, in which the framework of bars is fastened together by loose pins, so that the teeth can be set closer together or farther apart, as the state of the soil may require. The *H.* is used in bringing land that has just been ploughed into a proper condition for the reception of the seed, by breaking the clods of earth into smaller fragments, tearing out the roots of the weeds or stubble, and pulverizing and mixing the soil. To effect this, and to render the surface tolerably smooth and even, the land is rolled and harrowed two or three times with different *H.*, a strong, heavy *H.* being used to break the furrows made by the plough, and lighter harrows, with the teeth set more closely together, in the final stages of the process.

Harslet, the pluck of a pig; the heart, liver, and lights.

Hartall, another name for orpiment in the Eastern markets.

Hartford, the capital and principal commercial city of Connecticut, situated on the Connecticut River, at the head of navigation, about 36 m. N. N. E. of New Haven, and 100 m. N. of New York, in lat. 41° 45′ 59″ N., lon. 72° 40′ 45″ W. It is a port of delivery, attached to the district of Middletown, and has a resident U. States surveyor of the port. The city is well built, and contains numerous public buildings, prominent among which is the new capitol, erected at a cost of $2,500,000, and inaugurated in 1878. This splendid building is 295 feet 8 inches in length, 189 feet 4 inches in depth, and 257 feet 2 inches in height from ground to top of the crowning figure. The marble dome tower (still unfinished) rises in the centre of the building in a rectangular shape to the roof, and from there upward in the twelve-sided shape, with buttresses and columns on each of the twelve corners. Its diameter is 53 feet 4 inches. From roof to bottom of cone it is 75 feet 2 inches; the cone is 27 feet 4 inches in height; the lantern, 47 feet; globe and crowning figure, the "Genius of Connecticut," 15 feet. Four small towers, square in shape, rise with their finials 153 feet from the ground. *H.* carries on an extensive trade with the South and West, and has many flourishing manufactures, among which are the large establishment for the making of Colt's fire-arms, a large carpet company, one arms-manufacturing company, and several large iron-works and foundries. Its life and fire insurance business extends to every part of the country, and book-publishing is carried on to a considerable extent. Population, 40,000.

Hartford, a fire-insurance Co. located in Hartford, Conn., organized 1810. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $1,250,000; net surplus, $861,556 09. Risks in force, $188,039,953; premiums, $2,162,188.

Hartford, Providence, and Fishkill R.R. runs from Providence, R. I., to Waterbury, Conn., 123.36 m. This Co., whose offices are in Hartford, Conn., leases the following lines: The Pawtuxet Valley R.R., from Hope, R. I., to River Point, R. I., 3.20 m.; the Rockville R.R., from Vernon, Conn., to Rockville, Conn., 4.80 m.; and the South Manchester R.R., from Manchester to South Manchester, Conn., 2.25 m. The Co. was formed by the consolidation of the N. Y. and Hartford R.R. Co., the Providence and Plainfield R.R. Co. in R. I., the Hartford and Providence R.R. Co., and the Fishkill Landing and Easterly R.R. Co. The coupons due in 1858 not being paid, the whole property was taken possession of in that year by the trustees under the mortgage, and transferred to the New York and New England R.R. Co. on October 18, 1878. *Financial statement:* Cap. stock, common, $1,537,939.98, and preferred 10 %, $500,000; total, $2,037,939 98; funded debt, $2,055.500, consisting of 1st mortgage 7 % bonds extended to 1880.

Hartshorn. See AMMONIA.

Harvest, the time of reaping grain, or gathering in any crop.

Harvesting - Machine. See MOWER, and REAPER.

Hasheesh [Arabic], hemp, hay; also an intoxicating drug made of Indian hemp, which is sold in the East in the form of sweetmeats, paste, and tobacco.

Hasp, a fastening; a clasp that passes over a staple to be fastened by a padlock. — A spindle used in winding silk, thread, etc. — An agricultural implement used for scarifying the surface of grass-land.

Hassock, a footstool or cushion to kneel on; originally a rush-mat cushion, but now of more general signification.

Hastener, a metal kitchen-stand for keeping in the heat of the fire to the joint while cooking.

Hat [Fr. *chapeau*; Ger. *Hüt*; It. *cappello*; Sp. *sombrero*], a covering for the head, well known to everybody. *H.* are made of various forms and sorts of material. They may, however, be divided into two great classes, *viz.* those felted, or made of fur, wool, silk, etc., and those made of straw. The manufacture of felted *H.* has been carried to perfection in the U. States, where it was introduced at an early date. The largest *H.* manufactories are located in New York, Danbury, Conn., and Newark, N. J. Straw *H.* are also made on a very extensive scale, chiefly in Massachusetts, Connecticut, and New York. For the year 1878 the value of *H.* exported from the U. States (mostly to the Dominion of Canada) were: for wool, fur, and silk *H.*, $262,251; for straw *H.*, $46,838.

Imp duty: *H.*, bonnets, and hoods of straw, chip, grass, palm-leaf, willow, or other vegetable substance, or of hair, whalebone, or other material, n. o. p. f., 40 per cent. — *H.* braids, plaits, flats, laces, trimmings, tissues, willow sheets and squares, used for making or ornamenting the same, 30 per cent — Fur *H.*, 35 per cent. — Leather *H.*, 40 per cent. — Silk *H.*, 60 per cent. — *H.* linings, according to material — *H.* plush (see PLUSH).

Manuf. Felt *H.* are divided into many different grades, made principally of fur, the lower grades of wool, and in certain grades of a mixture of both materials. In the production of fur felts the material, after sorting and cleaning, is fed to a blowing-machine, which projects the particles against an upright revolving cone, made of wire gauze, and provided with an indrawing suction to cause adhesion of the particles. A light thin sack is thus formed, which is carefully wrapped in wet bagging and removed. Immersions in a hot bath and rolling make the sack or body ready for sizing, which is the process of shrinking and thickening the body to the required dimensions. This is accomplished by immersions in boiling water, with rolling and beating. The body is now stiffened, blocked into shape, pounced (*i. e.* sand-papered), and pressed. Next, the brim is trimmed to the desired width, and bound and (in the case of curl brimmed *H.*) flanged, when the *H.* is ready for lining. — *Wool H.* In the manufacture of wool *H.*, the process of forming and finishing the body is similar to that of making felt cloth, though less elaborate. Cheap grades of wool felts, designed principally for ladies' and children's wear, are made from felt cloth, stiffened and formed upon metal dies. These goods are known to the trade as *shoddy H.* — *Silk H.* are made of silk plush drawn over a very stiff but unfelted foundation. This foundation, according to the strength or the price intended, is made of calico, cambric, or other textile material, stiffened with shel lac and various other gums, and brought into shape by being worked over and around a block. The covering is a silk plush, woven with a kind of long velvet nap, or pile, on one surface, the best kinds of which are imported from France. The covering of the foundation with this plush is a work requiring much nicety, — to cut the plush so

as not to make much waste: to sew the pieces together after being cut; to give the foundation a coating of gum or cement; to fit the plush neatly on it; to cause the two to adhere by moisture and the pressure of a hot iron; to adjust the surplus plush carefully around the rim; and to brush and smooth the surface in such a way that the seams in the plush shall not be visible. — *Straw H.* are made of the straws of wheat, rye, oats, barley, Indian corn, etc., but those of wheat are most suitable. The Tuscan straw, from Leghorn and its neighborhood, is the finest and best of all; and this is the chief cause of the favor in which Leghorn hats and bonnets have long been held. Not only must the kind be selected, but individual straws are examined and sorted according to their length, colors, and thickness. Some straws are plaited whole, being merely pressed flat to facilitate the working. Others are split into four, six, or eight strips. This splitting is effected in a curious way. A wire, having four, six, or eight sharp edges, is thrust up the hollow of the straw so dexterously as to effect the required splitting, the strips being equal in width and smooth of edge. These slips, when softened in water, can be plaited as easily as whole straws. The straws (as many of them as are to make one width of plait) are fastened at one end, and rapidly plaited one over another diagonally, the nimble fingers of the workpeople turning them over from right to left and from left to right. The kinds of plait are indefinitely numerous, depending on the kind of straw, on its thickness, on its being whole or split, on the number of straws plaited together, and on the kind of pattern produced by the mode of plaiting. Large numbers of women and children were employed at one time in the U. States in plaiting straw, but now almost all the braid used is imported. Straw *H* and bonnets are generally sewn in this country by the American Bosworth Straw-Sewing Machine, on which, when run by steam, 100 ordinary *H* can be made in a day. The *H.* are then blocked, to give them the proper shape (see HAT-BLOCK), and then pressed by another machine, also of American invention, which smooths them ready for trimming at the rate of four a minute The number of men who, in this country, are employed in the straw *H.* manufacture is about 2,500; women, 15,000; youths under 16 years, 500. Grass, reeds, rushes, canes, broad fibres, or strips of almost every kind, can be plaited and made into *H.* in a somewhat similar way to that described above. See FELT, HAT-BLOCK, HAT-PRESS, etc.

Hat-Block is a form upon which the hat is finished. An important industry, developed in the last twenty-five years in connection with the production of straw hats, is the manufacture of plaster blocks made in the desired form, and to which pattern the hat is fitted and formed during the process of its manufacture. Previous to the inception of this industry, when the number of styles worn, and the changes made, were few, the hats were mostly sewed by measurement, and subsequently fitted and finished upon wooden forms. But the rapid development of straw hat manufacture in the New England States, and the numerous designs and frequent changes in styles, necessitated more rapid methods of duplication, which led to the invention of the *plaster of Paris hat block.* Duplications of the wooden block only were at first attempted, but the adaptability of plaster of Paris in the alteration of old and the production of new designs was soon discovered. The introduction of stamping machinery in the manufacture of buckram frames, silk, plush, velvet, felt, fur, and wool hats, and the invention and adoption of hydraulic presses in the manufacture of straw, fur, and wool hats, gave an additional impetus to this calling, on account of the necessary application of plaster of Paris in constructing the dies and other implements. The plaster-room of a hat-factory is of first importance, and the presiding genius a man of consequence, as upon his skill and taste in the adaptation of foreign novelties, and the production of new designs, depends much of the success of the establishment. From the knives with which the plaster models are cut and formed the artists engaged in this occupation have received the name of *whittlers,* — a name which but poorly describes a class of men in whom a rare combination of artist, inventor, and mechanic is essential to success. Prominent among the independent houses engaged in this business is that of Mr. A. Cuming, of New York, to whom we are indebted for the above information.

Hat-Body, the whole body of an unfinished hat, as the *cone* from a forming-machine; a cloth hat before finishing, the *carcass* upon which plush is attached to make a silk hat, etc.

Hat-Brush, a soft brush for smoothing the nap of a hat.

Hatch, the covering of a hatchway, or opening, to the hold of a ship. — A railroad flood-gate or half-door. — A crib in the weir of a river to stop fish. — To breed; to produce from eggs by incubation or by artificial heat.

Hatch-Boat, a kind of half-decked fishing-boat; one which has a hatch or well for keeping fish.

Hatchel, a combing instrument for dressing flax. See HACKLE.

Hatchet, a chopper or cleaver. See AXE.

Hatching, a style of drawing or engraving in which the shading is performed by lines crossing at angles less than 90°.

Hatching-Apparatus, an artificial incubator for bringing forth chickens from eggs by steam or hot water.

Hatchway, an opening in the deck of a ship, or in the floors of warehouses or stores, through which merchandise is raised or lowered.

Hat-Conformator, a machine of French origin, by which the oval shape of the head is ascertained. It consists of a series of sliding arms, radially arranged in a frame, and carrying at their upper ends sharp points. When applied to the head, as is a hat, the arms are thrust outward by contact with the head, and assume a position corresponding to the exact conformation thereof. While thus held an impression is taken upon a slip of paper pressed upon the points. This paper is trimmed to the form delineated by the points, and becomes a pattern by which an adjustable block is set for use in reshaping the form of a finished hat. — *E. H. Knight.*

Hat-Die. Same as HAT-MOULD.

Hat-Frame, cross-bars of wood placed round three or four dozen hats in sending them out for home sale.

Hat-Linings, leather, silk, or other inside trimmings for hats.

Hat-Money. See PRIMAGE.

Hat-Mould, the die in which a hat or bonnet is formed or shaped by pressing.

Hat-Press (Hydraulic) is a machine for bringing a *bat* or *cone* of hat-making material to the form of a hat.

When and where hydraulic pressure was first used in the manufacture of hats is a matter of dispute, but it is on record that Hiram West, of Attleboro', Mass., procured a patent dated July 6, 1858, for improvements in hat-pressing machinery, the patent covering the use of the rubber diaphragm in connection with water. It was not for some years, however, that the invention became generally utilized, on account of the expense and crudeness of the machinery, and the lack of experience and general knowledge of hydrostatic principles of the men employed in that branch of manufacture. As in labor-saving appliances generally, the advance has been towards simplicity and strength of construction, ease, economy, and rapidity of operation

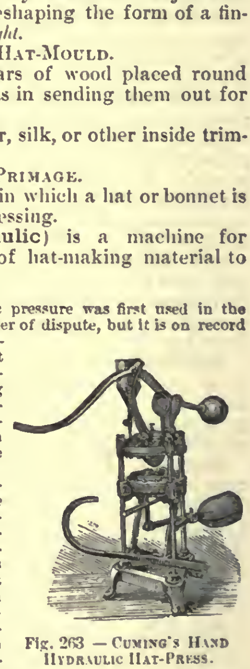

Fig. 263 — CUMING'S HAND HYDRAULIC HAT-PRESS.

These requisites are perfectly combined in the machine represented in Fig. 263. A rubber diaphragm, A, is bolted

to the head, B, into which water is introduced from the tank C. The die is placed in the die-seat, D. When the hat is in place, the press is closed and locked against a pressure of 25 lbs. per sq. in., obtained by the upward movement of the side-lever, E. connected with the rock-shaft, G, in operating the crank movement, H, in the process of closing and opening the machine. Further pressure is obtained by means of the lever, M, connecting with the pump, P This closing pressure is the principal feature of this machine.

Hat-shag Maker, a maker of imperial or silk plush for covering the bodies of hats.

Hat-spring Maker, a manufacturer of springs for light opera or closing-up hats.

Hatter, a maker or vender of hats.

Hatter's-bow-string Maker, a manufacturer of the fitted gut-cord used in bowing or felting the materials for beaver hats.

Hatter's-Furrier, a tradesman who prepares and keeps on sale the wool and different furs used for felting into hat-bodies.

Hat-tip Maker, a manufacturer of silk pieces for the lining of the crowns of hats.

Hattock, a Scotch name for a shock of corn containing 12 sheaves.

Hat-varnish Maker, a manufacturer of shel-lac varnishes, and other chemical preparations, for hatters.

Haugh, a little meadow.

Haul, to drag or pull.— A catch, as of fish, etc. — A ropemaker's term for about 400 threads of yarn warped off the winches with a slight turn in it, to be tarred.

Hauler, a workman engaged in drawing ore out of a mine. — A fisherman who pulls in a cast net to the shore.

Haunch, the hip or thigh; the hinder quarter of a small animal; sometimes applied to a joint of mutton or venison dressed.

Hauser. See HAWSER.

Haut, a measure at Bombay of 18½ inches; at Calcutta about 17½ inches.

Hautboy, a wild strawberry.—A musical wind instrument. See OBOE.

Haute-Lice [Fr.], tapestry hangings; an upright loom.

Haute-Marée [Fr.], high-water.

Havana. See CUBA (Seaports).

Havana Tobacco. See TOBACCO.

Haven, a port for shelter. See HARBOR.

Haversack, a soldier's knapsack; a gunner's case for ordnance.

Havre. See FRANCE (Seaports).

Haw, the berry of the hawthorn, used in Europe in cookery.

Hawaiian Islands, or Sandwich Islands, a rich, beautiful, and most interesting chain of islands in the North Pacific Ocean, forming the kingdom of Hawaii, extending from S. E. to N. W., in lat. 19° to 22° 15′ N., lon. 154° 48′ to 160° 20′ W., discovered by Cook in 1778. They consist of 13 islands, 8 of which are inhabited: Hawaii (formerly Owhyhee), Maui, Oahu, Molokai, Lanai, Nihau, Kohoolaui, and Kauai. The *H. I.* occupy a united area of 7,628 sq. m.; they are very mountainous, and appear to be chiefly of volcanic origin. Hawaii, the largest of the group, contains the two stupendous volcanic mountains, Mauna Loa, which is still in activity, and Mauna Kea, each rising to nearly 14,000 feet. The islanders are honorably distinguished among the Polynesian nations by the advances they have made in civilization; and particularly by their progress in manufactures, navigation, and commerce. Christianity was introduced by the American missionaries in 1820, and is now the religion of the state; schools have been established, churches have been built, and the forms of religion are pretty well observed. European usages have become fashionable, and the costume of the better classes, women as well as men, closely resembles that of the Americans. The staple exports of the islands are sugar, molasses, sirup, coffee, goat-skins, sweet potatoes, wool, hides, salt, tallow, beef, pu-lu, arrow-root, whalebone, whale-oil, and tropical fruits. Agriculture has made marked progress during the few last years, but the means of subsistence are so easily procured, that the inhabitants have but few inducements, even did they not lack the industry and enterprise, to become extensive agriculturists. There are large tracts of good grazing land scattered throughout the islands, and the growth of cattle is a leading, perhaps the most profitable, branch of agricultural industry. There are also numerous sheep ranges, on which are tended about 12,000 sheep; but the business has not been encouraging. The eminently advantageous position of the *H. I.*, lying on the great route between America and China, invited at an early period the enterprise and capital of several European and American settlers, and led to the establishment of a somewhat active trade. They constitute a common centre between the three principal whaling-grounds of the Northern Pacific, — one on the equator, another near Japan, and a third towards the Behring Sea.

The principal port is Honolulu, on the S. side of the island of Woahoo, in lat. 21° 18′ 3″ N., lon. 157° 55′ W. Pop. 12,000, of whom about 4,000 are Englishmen, Americans, and other foreigners. The harbor, to which the place owes all its importance, has a narrow entrance, but it is easy of access at all times of the tide to vessels not drawing more than 18 feet water. The bar at its mouth being narrow, and composed of soft coral, it might easily be made accessible even for line-of-battle ships.

The foreign commerce of the *H. I.* for 1878 showed a considerable gain over that of previous years The value of imports and exports for the 3 yrs 1876-1878, was as follows: —

	Imports	Exports
1878	$3,046,369	$3,548,471
1877	2,428,000	2,676,202
1876	1,811,770	2,241,041

The foreign goods taken by the islands consist chiefly of machinery and lumber (which amount to $650,000), clothing, hats, boots and shoes, dry goods, flour and grain, groceries and provisions, iron, steel, hardware, agricultural implements and tools, paints, oils, turpentine, spirits, wines, furniture, carriages, wagons, etc.

The commerce of the *H. I.* with the U States for the 10 yrs. 1869-1878, was as follows: —

Years	Imports from the U. S.		Exports to the U. States.	Total Imports and Exports.
	Domestic.	Foreign.		
1869	706,462	86,665	1,208,085	2,001,212
1870	804,371	64,045	1,144,248	2 012,664
1871	840,385	43,730	1,153,154	2,037,269
1872	620,295	43,469	1,285,320	1,919,084
1873	654,103	43,088	1,316,270	2,013,461
1874	623,280	26,348	1,071,172	1,693,800
1875	655,174	40,190	1,227,191	1,922,555
1876	754,267	54,990	1,382,592	2,191,849
1877	1,296,942	163,520	2,631,763	4,092,225
1878	1,783,696	52,653	2,688,430	4,524,779

The value of the principal articles imported from the U States for the year 1878 was as follows: Agricultural implements, $17,227; horned cattle, $2,905; horses, $6,950; sheep, $7,080; beer, $3,405; books, etc., $10,105; breadstuffs, $162,903, bricks, $10,453, carriages, $15,430; cordage, $10,582; cotton goods, $80,249; fancy articles, $16,260, fruit, preserved in cans, $9,358; gold and silver coin, $100,250, jewelry, $6,577; hats, $21,193, hay, $8,315, india-rubber goods, $7,557, stoves, $6,870; machinery and other manufactures of iron, $453,080; leather, $13,330, boots and shoes, $38,416, saddlery, etc.,

$18,257; matches, $6 094; mineral oil, $32,488; paper and stationery, $18,107; bacon and hams, $13,102; butter, $11,703; pickled and cured fish, $55,491; preserved meats, $10,424; potatoes, $9,671; rice, $6,800; sewing-machines, $8,681; whiskey, $10,165: refined sugar, $9,214; cigars, $7,140; sailing vessels, $51,950; wearing apparel, $67,776; wood (lumber, etc.), $184,225; household furniture and other manufactures of wood, $91,761.

The total of English, German, and French goods shipped to the islands in 1878 was about $670,000, or less than one third of what the U. States supplied. All European goods pay a duty of 10 % ad valorem, while American produce enters the *H. I.* free, under the reciprocity treaty concluded with the U. States, and which took effect in 1877. The cultivation of cane and manufacture of sugar in the *H. I.* has received a great impetus from that treaty, and the product for 1878 was 38,431,458 lbs. against 25,575 965 lbs. for 1877. The number of sugar plantations had also increased from 40 in 1877 to 60 in 1878. But the limit of sugar production in this group must soon be reached, as nearly all the available sugar land has been taken up, which fact, combined with the scarcity of labor, must fix the limit of the annual production of sugar at about 25,000 tons, or 50,000,000 lbs. American shipping employed in the trade with the islands numbered 183 vessels, of 110,671 tons register in 1878, which is more than double the tonnage of all other nations engaged in trade with the islands. Four steamers are now engaged in the island coasting-trade, to which 2, now building in San Francisco, will soon be added.

Although the *H. I.* appear to be in a very prosperous condition, it is a curious fact that the native population has been rapidly and steadily decreasing, and does not now probably exceed a third part of its amount at the epoch of their discovery. The population in 1847 is said to have amounted to above 112,000; while the census taken in 1879 fixes the total population of the islands at 58,000, of which 10,500 are foreigners.

Hawk, a small quadrangular piece of board used by plasterers to hold a small quantity of plaster while at work. It is held by a handle at the bottom.

Hawker. It is not very easy to distinguish between hawkers and pedlers. Both are a sort of itinerant retail dealers, who carry about their wares from place to place; but the former are supposed to carry on business on a larger scale than the latter. They are generally required to take out licenses under the State laws.

Hawk's-bill Turtle, the *Chelone imbricata*, valued for its shell, which is employed for manufacturing purposes.

Hawse-Block, the wooden plug or stopper fitted into the hawse-hole when the ship is at sea.

Hawse-Hole, the hole in the bows of a ship through which the cable runs.

Hawser. See CABLE.

Hay [Fr. *foin;* Ger. *Heu;* It. *fieno;* Sp. *heno*], any kind of grass cut and dried for the food of cattle. The great object in preparing grass for hay is to preserve the green color of the grass as much as possible, and to have it juicy, fresh, and free from all sorts of mustiness. The hay and fodder crops, including the dried blades, shucks, and tops of Indian corn, as well as of the succulent corn plants, and other green forage, cultivated solely for *soiling*, or for drying into fodder, chopped straw, the haulm of beans, pease, potatoes, etc., which are by no means inconsiderable, are far the most valuable of any in the U. States. The culture of hay is principally confined to the Eastern, Middle, and Western States, from which the Southern markets are mainly supplied in the form of pressed packages or bales. The principal indigenous grasses which have been successfully cultivated in this country are the Kentucky blue grass, the red-top (herds-grass of Pennsylvania), the white clover, and the fowl-meadow (or bird-grass). Pre-eminent in extent of cultivation among our forage crops of foreign origin are the timothy (herds-grass of New England), and the common red clover.

The following table exhibits the production, acreage, and value of hay in the U. States for the year 1878: —

States.	Tons.	Acres.	Value.
Maine	1.138.000	1.264,444	$14.225.000
New Hampshire	715.000	650,000	8.437,000
Vermont	1,050,000	1,071.428	10,605.000
Massachusetts	665,000	665,000	10,108,000
Rhode Island	120,000	116,505	2.280,000
Connecticut	580,000	527.272	10.875,000
New York	5,250,000	4.375,000	50.400.000
New Jersey	610,000	469.231	8,601,000
Pennsylvania	3,020.000	2,516,667	29,294,000
Delaware	40,000	36,363	560,000
Maryland	240.000	192.000	2,700,000
Virginia	260.000	200,000	2,860,000
North Carolina	126,000	93.333	1,218,420
South Carolina	21,500	20,283	307,450
Georgia	21,800	17,440	348,800
Florida	....	....	....
Alabama	23.500	18.077	305,500
Mississippi	25,500	18,214	408,000
Louisiana	....	....	....
Texas	75,000	60,000	806.250
Arkansas	20,000	14.286	260.000
Tennessee	152,000	116,923	1,744,960
West Virginia	290,000	223,077	2,465.000
Kentucky	320,000	246,154	3,120,000
Ohio	2,100,000	1,680,000	16,884,000
Michigan	1,160,000	878,788	9,976,000
Indiana	1,050,000	846,774	6,825,000
Illinois	3,936,000	2,460,000	23,104,320
Wisconsin	1,350,000	1,038,461	9,450,000
Minnesota	1,070,000	891,667	5,617,500
Iowa	2,550,000	1,961,538	12.112,500
Missouri	1.0 0,000	750,000	7,350,000
Kansas	1,155,000	700,000	4,042.500
Nebraska	475,000	327 586	1,733,750
California	560,000	622,222	8.400,000
Oregon	160,000	106,667	1,760,000
Nevada, Colorado, and the Territories	250,000	192 308	2,750,000
Total	31,629,300	25,367,708	$271,934,950

Our exports of hay for the year 1878 (chiefly to the West Indies) amounted to 9,514 tons, valued at $141,340.

Hay-Band, a rope made of twisted hay.

Hay-Cock, a pile or heap of hay in a field.

Hay-Fork, a pronged instrument for turning over hay, or lifting it from the cart to the rick.

Hay-Knife, a long, sharp cutting instrument for taking hay from a hay-rick.

Haymaker, an agricultural laborer; one who cuts grass and turns it over from time to time in the sun to be dried for hay.

Haymaking-Machine, a grass-cutting apparatus taking the place of the scythe.

Hay-Market, a place in a town whither hay is brought for sale.

Hay-Rake. See RAKE.

Hay-Rick, a pile or stack of hay.

Hayti and San Domingo (Republics of). Hayti, also frequently called San Domingo, is one of the largest and most fertile of the West India Islands. It extends in length from E. to W. 390 m., and in breadth from 60 to 150 m., between lat. 17° 37′ and 20° N., lon. 68° 20′ and 74° 28′ W. The country was formerly divided between the Spaniards and the French. The line of demarcation which separated these two divisions commenced on the S. side, from the Pedernales or Flint River, and extended in a waving direction to the river Massacre, on the N. side. The country to the W. of this line, which is of an extremely irregular figure and deeply penetrated by the Gulf of Gonaives, belonged to the French, and now forms the *Republic of Hayti.* The country on the E. side, by far the greatest portion — but also the most mountainous — of the island, belonged to the Spaniards, and now constitutes the *Republic of San Domingo.* A great part of the coast of this island is rocky and dangerous, affording but an imperfect

shelter to vessels overtaken by storms. Many of the shipping-places on the S. shore are nothing more than open bays, which lie exposed to the storms and hurricanes of the autumnal months. The harbor of San Domingo, formerly thought so commodious and secure, has become too shallow to admit vessels of large burden. There are, however, besides roadsteads and several small harbors, the bays of Neyba and Ocoa on this coast. Into the former flows the river Neyba, which receives vessels of 30 tons burden: its stream, before entering the ocean, divides itself into various channels, which, annually changing, confound the pilot and render the navigation difficult. Ocoa Bay is a large and convenient watering-place, with several small rivers falling into it. The entrance is two leagues across, and it gradually widens to nearly six. On the E. side of this bay is the safe and capacious port of Caldera. On the S. E. coast is the great Bay of Samana, which, in point of size and situation, is one of the most important on the island. From Cape Raffael, which forms the S. point of entrance into the Bay of Samana, to the opposite side of the island or peninsula of Samana, the distance is 18 m., which is closed in by bulwarks of rocks and sand, the entrance only being left clear, with a safe and deep channel between the shore of Samana and several detached islands. This bay is about 60 m. long, and is surrounded on every side by a fertile country, suited to all the purposes of trade. Within the compass of this bay whole fleets might ride at anchor in perfect security. The river Yuna, after being joined by the Cambu, and meandering through the rich plains of La Vega Real, falls into the Bay of Samana after a course of nearly 100 m. Bahia Ecossaise, or Scotch Bay, which is situated on the N. side of the peninsula of Samana, is a dangerous, rocky place. Thence to Puerto Plata the coast extends about 60 m. in a N. W. direction, and in this square stands Balsama Bay, which has only 14 feet depth of water, and is of difficult navigation. The entrance of the harbor of Puerto Plata is narrow, but safe, and the neighborhood is rich in every species of timber-trees. There are several other small harbors and bays on this side of the island, but the coast is in general rocky and dangerous. — *Soil and Surface.* A country of such magnitude as Hayti, containing mountains of great height, with valleys of corresponding extent, necessarily comprises great variety of soil. In general, however, it is fertile in the highest degree, being everywhere drained by copious streams, and yielding in abundance every species of vegetable produce which can minister either to the luxury or comfort of man. The soil consists principally of a rich clay, sometimes mixed with gravel, lying on a substratum of rock. That part of the island formerly occupied by the French is mountainous, but fertile and well wooded, and containing mines both of silver and iron. The Spanish or San Domingo part of the island is mountainous in many parts; while in other parts the country is spread out into extensive plains. These are generally in a state of nature, covered with herbage, or with woods of immense growth and the most luxuriant foliage. The mountains intersect the island in two principal chains from E. to W. From these secondary and partial ridges diverge irregularly in different directions, forming beautiful and fertile valleys, with numerous streams. The highest mountains of the interior, particularly those of Cibao, rise to the height of 7,200 feet above sea-level. To the N. of Port-au-Prince is the valley called Vega Real, or Royal Plain, which is by far the largest and finest in the island. Westwards it extends to the old French line of demarcation, and in this part it is drained by the river Yocki; to the E., where the river Yuna flows for the space of 50 m., it projects to the head of the Bay of Samana, and is drained by numerous smaller streams which cross it in various directions. This valley may be said to extend in length about 140 m., and in breadth from 20 to 30. Other plains also, of

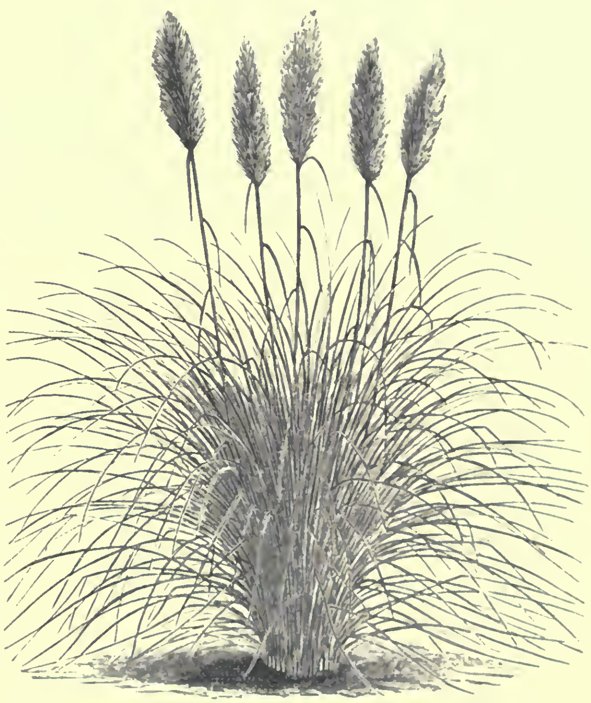

Fig. 264. — Gynerium argenteum.

less extent but of equal fertility, and of easy access, are everywhere found interspersed among the mountainous tracts. Eastward from Port-au-Prince are those immense plains called *Los Llanos*, which stretch out to a vast extent on a dead level. They are covered with herbage, and the eye wanders unobstructed over the wide expanse of waving grass, intersected with the *Gynerium argenteum*, or pampas grass (Fig. 264), and occasionally diversified by natural clumps of shrubs. These plains occupy almost one sixth part of the island, extending nearly to its eastern coast, being a distance of more than 90 miles, by about 30 wide. They form an immense natural meadow, covered with pasture for vast herds of cattle which belong to more than 100 different owners. — *Climate.* Hayti has a hot moist climate, but the heat is mitigated by the regularity of the sea-breeze, and by the contiguity

of the mountains. In the plains the thermometer rises to 96°, sometimes to 99°, but in the mountainous tracts it seldom rises above 78°. In the most elevated part a fire is frequently necessary. In those situations meat may be kept for several days, and in the morning hoar-frost is frequent. The seasons, as in tropical countries, are divided into the wet and the dry. The rains are periodical, and are heaviest in May and June, when the rivers, which at other times scarcely supply water for a continued stream, overflow their banks, and, with an impetuous torrent, sweep over the neighboring plains. The climate of Hayti is unhealthy to Europeans, owing to the violent heats and heavy rains; and all metals, however bright their original polish, soon contract a tarnished appearance. This is more observable on the sea-coast, which is also more unhealthy than the interior of the island. Hurricanes are not frequent, but in the southern parts of the island violent gales of wind, generally preceded by a closeness and sultriness in the atmosphere, frequently occur. These, however, are not attended with such fatal effects as the hurricanes in the Windward Islands. — *Vegetable Productions.* The fertile soil of *H.* is distinguished by the variety of its vegetable productions, many of which are rare and valuable. The mahogany-tree grows to a great size, and is of very fine quality. The manchineel-tree affords a beautiful species of wood, richly veined like marble, and susceptible of the finest polish. Several species of dye-woods are produced in the forests. There is a tree called the jagua, the fruit of which is accounted a delicacy by the natives; and of which the juice, as clear as water, makes a stain on linen which is indelible. Different kinds of guaiacum are found, as also of several other woods with the same properties, which grow unnoticed and nameless in those unexplored forests. The sideroxylon, or iron-wood, is abundant; and the oak also, which differs in appearance from the European oak, frequently furnishes beams of from 60 to 70 feet in length. On the N. side of the island are extensive forests of pine, which is much used for the purposes of ship-building; and Brazil-wood is found on many parts of the coast. The satin-wood of this island is heavier than that of the East Indies, and it takes so fine a polish that it does not require to be varnished. The cotton-tree is the largest of all the vegetable productions, and is formed into the lightest and most capacious canoes. Every variety of the palm-tree is found in the woods, of which they form a principal ornament. In the congenial soil of this fertile island the sugar-cane, cotton, and coffee-plants grow in the greatest luxuriance. There is also the calabash, the fruit of which serves as a substitute for earthenware; the plantain, the staff of life in the West Indies; vanilla, which is found indigenous in the unfrequented woods; quassia, or simarouba, which is a tall and stately plant, waving gracefully in the wind; sarsaparilla, indigo, tobacco, turmeric, ginger, and rice-plants. Of the fruits and nutritive roots of Hayti there may be enumerated the choux caraib, or Indian kale, with a variety of other vegetables that come under the same denomination; the avocato, or vegetable marrow, the melon, sapadillo, guava, pine-apple, bread, and jack-fruit, mango, nuts, rose-apple, plums, etc., of many different species. Flowers in endless variety and splendor adorn the wild scenery of the woods and exhale their fragrance in the desert air. — *Minerals.* The mineral products are various and rich, and include gold, platina, silver, quicksilver, copper, iron, tin, sulphur, manganese, antimony, rock-salt, bitumen, jasper, marble, opal, lazulite, chalcedony, etc. The gold mines of the Chiboa Mountains, which in the 16th century were very productive, have been abandoned, and at the present day gold is obtained only from the washings in the northern rivers. None of the mines, indeed, are successfully worked, and hence these sources of wealth are reserved for the industry of future generations.

Republic of Hayti.

This republic, which embraces the western portion of the island, with an estimated area of 10,204 sq m., is governed under a constitution proclaimed June 14, 1867 By its terms the legislative power rests in a National Assembly, divided into two chambers, respectively called the Senate and the House of Commons. The latter is elected by the direct vote of all male citizens for the term of three years, while the members of the Senate are nominated for two years by the House of Commons from a list presented by the electoral colleges. The executive power is in the hands of a President, who, according to the Constitution, must be elected by the people, but in recent years has generally been chosen by the united Senate and House of Commons, sitting in National Assembly, and in some instances by the troops, and by delegates of parties acting as representatives of the people. The nominal term of office of the President is four years; however, it is generally cut short by insurrections — The public revenue and expenditure are known only by estimates, long-continued civil war having brought extreme disorder into the finances of the republic. It was reported that the receipts from customs, chief source of revenue, amounted to $839,000 in the year 1878. The total public revenue is calculated to have amounted in recent years to about $4,500,000, and the expenditure to $7,000,000.

There is a large floating debt, consisting chiefly of paper money issued by successive governments, the greater mass enormously depreciated by frequent repudiation, and by forgery on a vast scale. There is also a foreign debt, consisting of a loan of 11,949,840 francs, or $2,389,968, contracted at Paris in 1825, and of other liabilities incurred towards France, the total amounting to 32,049,840 francs, or $6,409,968 No interest has for years been paid on this debt. Nevertheless, the government issued in June, 1875, with partial success, a new foreign loan of 83,453,000 francs, or $16,690,600, through the house of Marcuard & Co., Paris, the avowed object being to extinguish the old debt, both home and foreign, and to employ the remainder for the construction of two lines of railway

A census of the population does not exist; the inhabitants, the moiety of whom are negroes, and the rest French-speaking mulattoes, with very few of European descent, are calculated by the best authorities to number about 572,000, while official estimates give them at 800,000. The capital is Port-au-Prince.

The commercial intercourse of the republic is chiefly with the U. States and Great Britain, the former contributing about 55 per cent and the latter 30 per cent to the aggregate imports and exports The total annual imports in the 4 years from 1875 to 1878 averaged $7,000,000, and the exports $8,000,000. The principal articles exported are coffee, mahogany, and logwood.

There is no report of the exact value of the commercial intercourse of the republic with the U. States in the "Annual Statement" published by the Department of the Treasury, which throws Hayti together with San Domingo. But as the population of the latter State is only about ¼ that of Hayti, an estimate may be made of the respective distribution of exports and imports during the 20 years from 1859 to 1878, given in the following table: —

Years.	Imports from the U. States.		Exports to the U. States.	Total Imports and Exports.
	Domestic.	Foreign.		
1859....	$2,274,473	$230,079	$2,859,636	$5,364,188
1860....	2,597,959	245,023	2,345,821	5,188,803
1861....	2,418,664	187,994	1,926,693	4,533,351
1862....	3,088,108	191,731	1,910,922	5,190,761
1863....	4,106,868	362,203	1,878.337	6,347,408
1864....	4,272,864	312,132	2,032,712	6,617,708
1865....	6,228,684	406,226	1,522,965	8,157,875
1866....	3,596,735	229,793	1,239,201	5,065,729
1867....	2,405,498	348,413	1,022,079	3,775,990
1868....	3,021,093	301,710	843,450	4,166,253
1869....	1,349,438	129,462	729 632	2,208,532
1870....	2,617.633	183,700	979,655	3,780.988
1871....	2,791,057	173,949	1,055,675	4,020,681
1872....	3,326,747	244,232	1,517,951	5,088,930
1873....	4,854,246	416,997	2,260,425	7,531,668
1874....	4,780,339	201,401	1,933,177	6,914,917
1875 ...	5,350,237	123,372	2,548,389	8,021,998
1876....	5.428,583	146,552	3,481,562	9,056,697
1877....	4,513,597	107,584	3,864,418	8.485,599
1878....	4,807,432	88,922	4,174.924	9,071,278
Total.	$73,830,255	$4,631,475	$40,127,624	$118,589,354

The value of the principal articles imported from and exported to the U. States by the Republic of Hayti and San Domingo was as follows: *Imports:* Books, etc., $10,798; breadstuffs (chiefly wheat flour), $719,113; candles, $13,717; carriages, $17,605; cotton goods, $304,814; drugs, etc., $11,587; gold and silver coin, $67,213; iron manuf., $94,056; matches, $8,341; mineral oil, $80,723; paints, $6,747; paper and stationery, $6,224; bacon and hams, $38,716; salted beef, $49,412; butter, $56,594; cheese, $15,487; fish (dried and pickled), $790,592; lard, $117,302; pork, $905,254; sewing-machines, $5,007; soap, $268,526; refined sugar, $71,064; leaf tobacco, $37,322; trunks, $13,377; wood (boards, deals, etc.), $150,787; wood (household furniture and other manuf of), $55,466 *Exports:* Drugs, dyes, etc., $24,858; cocoa, $17,249; coffee (12,813,113 lbs.), $1,891,207; cotton (raw), $45,493, dye-woods in sticks, $795,605; silver coin (American), $769,255; brown sugar, $20,510.

Money, Weights, and Measures. The standard of money is the *Piastre*, or dollar = about $1. French gold and silver coins are in current use. The weights and measures in use are those of France.

Regulations as to Trade It is enacted that all persons exercising any trade or profession, excepting that of cultivating the soil, must be provided with a patent or license to carry on such trade or profession; that all strangers admitted as merchants into the republic must, in the first place, procure the permission of the president to take out a patent, which, when obtained, only authorizes them, under heavy penalties, to carry on a wholesale business, not with each other, but with the Haytians, in the open ports, which are Port-au-Prince, Gonaives, Cap Haïtien, Jacmel, Aux-Cayes, and Jérémie. The minimum quantities of goods that may be sold are fixed by the same law. The Haytian consignee may be also a retailer, on taking out a correspondent patent.

Seaports. Of the ports above enumerated the principal are: —

Aux Cayes, or *Les Cayes*, on the S. coast of the island, 92 m. W. S. W. of Port-au-Prince. The city is generally reputed one of the most progressive in the island, and is the capital of the southern peninsula of Hayti; the best irrigated and most fertile province in the republic. Here, as in the other ports, the U. States holds the first commercial rank. The chief imports from the U. States are provisions and cotton goods. Pop. 10,000.

Cape Haytien, formerly *Cape Français*, on the N. coast, in lat 19° 40′ N., lon. 69° 54′ W. It has the safest harbor of the island, and carries on a considerable trade, chiefly with the U States. Pop. 10,000.

Gonaives, on the gulf of that name, about 55 m. N. W. of Port-au-Prince, now exhibits scarcely the shadow of its former commerce. Its exports consist chiefly of coffee, which is of the very best quality, and commands the highest price. Hence it is that vessels which cannot make up their cargoes of coffee at Port-au-Prince touch at this port for such quantities as they can obtain. Pop. 8,000.

Port-au-Prince, the capital and chief commercial port of Hayti. The light-house on Lamentin Point is visible for 9 m in lat. 18° 33′ 35″ N., lon. 72° 25′ 12″ W. It is situated on the W. coast of the island, at the bottom of a large and deep gulf. It is partially fortified, the harbor being protected by a battery on a small island at a little distance from the shore. The country round is low and marshy; and the heat in the summer months being excessive, the climate is then exceedingly unhealthy. The buildings are principally of wood, and seldom exceed 2 stories in height. The entrance to the harbor is between White Island and the S. shore. The depth of water varies from about 18 feet at ebb to about 21 feet at full tide. It is customary, but not compulsory, to employ a pilot in entering the harbor. Pilots are always on the lookout. Ships moor, head and stern, at from 100 to 500 yards from shore; loading and unloading by means of boats, as there are neither docks nor quays to assist these operations. The harbor is perfectly safe except during hurricanes, which may be expected from August to November. The bay of Port-au-Prince is wellnigh blocked up to the northward by numerous shoals and islets, which protect the anchorage. Pop. 35,000.

REPUBLIC OF SAN DOMINGO.

(*República Dominica.*)

This republic, which embraces the eastern part of the island, with an estimated area of 18,045 square miles, is governed under a constitution proclaimed November 14, 1865. By its terms the legislative power is vested in a National Congress of two houses, called the Consego conservador and the Tribunado; the first consisting of 12, and the second of 15 members. The members of both Houses are chosen in indirect election, with restricted suffrage, for the term of 4 years. But the powers of the National Congress only embrace the general affairs of the Republic; and the individual states, five in number, have separate legislatures. The executive power is vested in a president, chosen in indirect election for the term of 4 years. Constant insurrections have allowed very few presidents to serve the full term of office. The public revenue is about $900,000 with an expenditure to the same amount. The revenue is mainly derived from customs duties, which average 40 per cent, while a large part of the annual expenditure is for the maintenance of a standing army. Besides a large internal debt, of unknown amount, San Domingo has a foreign debt contracted at the London Stock Exchange in 1869. The debt, to the nominal amount of £757,700 ($3,788,500) at 6 per cent, was issued at the price of 80; but it was stated officially that the government had actually received only between £38,000 and £50,000 from the contractors for the loan.

The republic is divided into the five provinces, or states, mutually independent, of San Domingo, Azua de Compostela, Santa Cruz del Seybo, Santiago de los Caballeros, and Concepsion de la Vega. Pop. about 250,000, or 14 to the sq. m. The pop., like that of the neighboring Hayti, is composed mainly of negroes and mulattoes, but the whites, or European-descended inhabitants, are comparatively numerous, and owing to their influence the Spanish language is the prevailing dialect. The capital of the republic is the city of San Domingo, founded in 1494.

The commerce of the republic is small, owing in part to customs duties of a prohibitory character. The principal articles of export are, tobacco, coffee, dye-woods, and sugar. In 1878 the value of the imports amounted to $1,963,046, and of the exports to $1,678,911. (For the commercial intercourse of San Domingo with the U. States, see page .)

Money, Weights, and Measures are those of Spain, but the French metrical system is coming in use.

Seaports. The chief seats of commerce are San Domingo City, Porto Plata, and Samana, a small town on the peninsula of the same name (see page). The city of San Domingo is situated at the mouth of the Ozama, on the S. coast, in lat. 18½° N. and lon. 70° W., and is the oldest European settlement in the New World. The town is defended by substantial fortifications. The cathedral is more than three centuries old. The harbor is capacious, but, owing to a bar at its mouth, vessels drawing above 13 feet of water are obliged to anchor in the open roadstead. Pop. 15,000.

Hazel-Nut [Fr. *noisette, aveline;* Ger. *Haselnuss*, It. *nuainola, avelina;* Port. *aveltaa;* Sp. *avellana*], the edible nut of *Corylus avellana*, a small underwood, which is found growing wild in the forests of all parts of temperate Europe, and much resembles *C. Americanus*, which grows in thickets and borders of fields throughout the U. States. Hazel-nuts yield, on pressure, about half their weight of a bland fixed oil, often called *nut-oil* in England, the hazel-nut being popularly known by the term *nut* alone. But in France and in Germany it is walnut-oil which is usually called nut-oil. Hazel-nut oil has drying properties, and is much used by painters; it is also used by perfumers as a basis with which to mix expensive fragrant oils; and it has been employed medicinally in coughs. The wood of the hazel, although seldom large enough for the purposes of the carpenter, is very tough and flexible, and hazel-rods are therefore much used in Europe for making crates, hurdles, hoops for small barrels, etc. The thicker stems of hazel are used for making charcoal, which is in great request for forges, is much esteemed for the manufacture of gunpowder, and is the kind preferred by artists for crayons. Most of the cultivated varieties of the hazel-nut are known by the names of *cob-nuts* and *filberts*, the former generally of a roundish form, the latter characterized by the greater elongation and laciniation of the fruit-cup. The *Red Filbert*, or *Lambert's Nut*, is remarkable for having the pellicle which surrounds the kernel of a crimson-red color. Hazels are imported from Spain, Smyrna, Sicily, and other places. They are used in this country exclusively for the table and confectionery. *Imp.* duty 3 cts. per lb.

Head, the principal, chief, upper, or foremost part of a thing; the top of extremity of a thing, especially when larger than the other part or parts; as, the *head* of a mast, of a spear, cabbage, nail, cane, etc. — The fore or front part, or the place where the head should go; as, the *head* of a bed, the *head* (or hood) of a carriage. — A chief; a principal person of any organized body; a leader. — A bundle of flax measuring about 2 feet in length, and weighing a few pounds; in the North of Europe 18 head of hemp or flax are about 1

cwt. — The fore extremity of a ship. It generally means the cutwater, which is adorned with a figure. *By the head*, implies that the ship's head is depressed in the water. *Head sails, head yards*, are the sails and yards in the fore part of the ship.

Head-Band, a bookbinder's material of narrow silk or other substance, sold in pieces of a certain number of yards. It is used in fine bindings as a finish to the top and bottom of the sheets inside the back.

Head-Dress, a cap, feathers, or any ornament worn on the head by females.

Header, a cooper who closes casks. — A workman who heads nails or pins. — A brick with a short face in front.

Head-Fast, a rope to secure a ship's bows to the wharf or shore.

Head-Gear, the bridle of a horse; the head-stall and bit.

Headings, pieces of wood suited for closing sugar hogsheads, and other casks of merchandise. Bangor and Portland are the principal depots for their sale.

Head-Light, a light, usually an oil-lamp, carried at the front end of a locomotive, to illuminate the way and act as a signal.

Head-Lines, in printing, lines conspicuously displayed at the top of a page, or to a chapter, which are set in small capitals. — In navigation, ropes next the yards.

Head-Man, a principal workman.

Head-Matter, spermaceti in its natural crude state, as taken from the cavity in the large head of the sperm whale, *Physeter catodon*.

Head-Nets, caps or coverings for the head, worn by ladies. They are made of human hair, silk, glazed and polished thread, etc., netted in open meshes.

Head-Rope, that part of a bolt-rope fastened to a sail.

Headstall, the part of a horse's bridle which goes over the head.

Head-Stocks, the frames which support the centres of a lathe: viz., the mandril-frame and the poppet-head, or back centre-frame; also, the framings used for supporting the gudgeons of a wheel.

Head-Stone, the chief or principal stone in a foundation; the corner-stone. — The stone placed at the head of a grave.

Head-Valve, the delivering valve of a steam-engine.

Headway, the progress made by a ship or boat in the water. — A passage in a mine driven in the direction of the layer of coal.

Head-Workman, the principal operative in an establishment.

Healing, the covering a roof with tin, slates, etc.

Healds, the harness for guiding the warp-threads in a weaver's loom.

Heap, a pile, as of stones, dung, etc.

Heap-Measure, as described in the New York State Law, is a measure in which the commodity is heaped up above the sides in the form of a cone, the outside, or outer edge of the measure being the limit of the base of the cone, and the cone to be as high as the article will admit.

Hearse, a funeral carriage for conveying a corpse to be buried.

Hearse-Cloth, a coffin pall.

Heart, the chief part; the inner part of anything; the middle part, or interior; the vital part; the centre of action or motion. The heart of wood is the solid portion divested of sap-wood, or alburnum.

Hearth, a floor for a fire.

Hearth-Broom, a sweeping brush for the hearth or grates.

Hearth-Rug, an ornamental rug or carpet-work laid before a fire-hearth.

Heart-Wheel, Heart-Cam, the name given to a well-known mechanical contrivance for converting a circular motion into an alternating rectilinear one, which is generally adopted in the machinery of cotton-mills. It consists of an ellipse turned either on an axle, or by means of a winch and handle in one of its foci, or its centre, or whose edge a movable point or circle presses; the latter receives an alternating motion from the circumference of the ellipse, which in its motion presses it to different distances from the centre of motion. The practical disadvantages of this contrivance are, the inequality of pressure and of moving force which will be required at different parts of the rotation of the ellipse, and the consequent wearing of some parts of it before the remainder.

Heat, Caloric. The vast range of scientific investigations concerning this subject belongs to physics and chemistry; but the practical results to which these investigations have led exert a direct influence on all such manufacturing operations as smelting, forging, welding, melting, distilling, gas-making, etc.; and upon the evolution of power in steam and hot-air engines. Temperature, dilatation, expansion, vaporization, conduction, radiation, — these and other terms serve to denote the several modes in which heat makes its effects manifest. Much useful information, in connection with these heat-producing and heat-produced effects, will be found in this work under the heads COMBUSTION, EBULLITION, EVAPORATION, EXPANSION, REFRIGERATION, STOVE and HEATING APPARATUS, etc.

Degrees of Heat See THERMOMETER and PYROMETER.

Mechanical Equivalent of Heat. An immense stride has been made in the philosophy of manufactures by the determination of the mechanical equivalent of heat, chiefly through the patient and masterly experiments of Dr. Joule. Heat, according to the modern view, is convertible into mechanical force or energy; and a given quantity of the one is found to be equal to, or productive of, a given quantity of the other. This equation has been ascertained by measuring the friction of solids, liquids, and gases under various conditions, as productive of heat, and, conversely, by measuring the mechanical work effected by a given amount of cooling. The *unit of power* is taken to mean the force which will lift 1 lb. 1 foot high; this is called a *foot-pound*. The *unit of heat* employed is that quantity of heat which will raise 1 lb of water 1° F. in temperature. Now it is found that about 772 of the former are equivalent to 1 of the latter; that is, an amount of heat which would increase by 1° F. the temperature of 1 lb of water would, under altered arrangements, lift a weight of 772 lbs. 1 foot high. This ratio, which receives the name of *Joule's equivalent*, is becoming very important in settling the theory of the hot-air engine, steam-engine, and other machines worked through the instrumentality of heat.

The following table shows the heating power of various combustible substances, exhibiting the utmost quantity of water evaporated by the given weights, and the smallest quantity of air capable of producing total combustion, according to Dr. Ure: —

Species of combustible.	Pounds of water which a pound can heat from 0° to 212°	Pounds of boiling water evaporated by 1 pound.	Weight of atmospheric air at 32° to burn 1 pound.
			Least quan.
Perfectly dry wood........	35.00	6.36	5.96
Wood in its ordinary state.	26.00	4.72	4 47
Wood charcoal...........	73 00	13 27	11 46
Pit coal.................	60 00	10 90	9 26
Coke....................	65 00	11.81	11.46
Turf.....................	30 00	5.45	4 60
Turf charcoal............	64.00	11.63	9 86
Carburetted hydrogen gas.	76.00	13.81	14.58
Oil / Wax / Tallow	78 00	14 18	15 00
Alcohol of commerce......	52.60	9.56	11 60

Heater, any contrivance used to impart heat; a stove; a furnace, etc. See STOVE AND HEATING APPARATUS. — A triangular mass of iron, which is heated in the fire, and put into a box-iron to smooth cloth.

Heave, in nautical phrase, to employ force to move great weights by the lever, etc.; as to *heave up* the anchor by the capstan or windlass; to *heave down* the ship, or pull her over on one side to get at a leak; also to heave taught (tight), or turn the capstan till the rope or chain applied to it becomes tight.

Heaver, a stevedore or 'long-shore man. — A short wooden bar tapering at each end, used as a purchase or prising lever.

Heavy, weighty; ponderous.

Heavy-laden, vessel sitting deep in the water, which has a full cargo; vehicle carrying a large burthen.

Heavy Spar. See BARYTES.

Heck, a rack or crib for cattle, etc., to feed at. — A contrivance of lattice-work for catching fish. — A weaving apparatus through which the threads of warps pass from the bobbins to the warping-mill, and by means of which they are separated into sets for the heddles.

Heckle, a flax-dresser's comb or machine for cleaning and subdividing the fibre. See FLAX (MANUFACTURE OF).

Hectare. See ARE.

Hecto, a Greek prefix to French weights and measures, signifying a hundred times greater.

Hectogramme. See GRAMME.

Hectolitre, 100 litres, a French liquid and dry measure of capacity = 26.4178 gallons, or 2.8378 bushels.

Hectomètre. See MÈTRE.

Hectostere. See STERE.

Heddle, in weaving, one of the sets of parallel double threads which are arranged in sets, and, with their mounting, compose the harness employed to guide the warp threads to the lathe or batten; heald. — *Heddle-eye* is the eye or loop formed in each heddle to receive a warp thread.

Hedge, a fence of bushes or living plants; a bank or mound.

Hedgehog, a dredging-machine, employed in harbor works and rivers for removing shoals formed by accumulated mud or silt. — A small insectivorous quadruped, the *Erinaceus Europæus*, sometimes kept in bake-houses and kitchens to eat up cockroaches.

Hedger, a workman who has the charge of repairing hedges and ditches.

Hedge-Scissors, large shears for trimming quick-set hedges.

Heel, the hinder part of the sole of a boot or shoe, built up of pieces of leather. In shoe manufactories heels are made with great rapidity by a series of separate machines which cut out and compress *lifts* to shape; fasten together the several lifts which compose a heel; trim or burnish the edges of the lifts (Fig. 265) so as to bring the heel to symmetrical shape; cut down the front, which is called *breasting;* cut the seat for the heel; lay on and secure the *rands;* fasten the heels to the boots; dress the heel-faces; polish the heels; and give the stitch-marks along the edge on the upper surface. — The after extremity of a ship's keel. — A nautical term for the lower end of anything, as of a rafter, a tool, a mast, boom, stern-post, etc. *To heel over*, to incline to one side.

Heel-Ball, a hard wax, or polishing substance, used by shoemakers to give a shining black surface to the sole edges of new boots or shoes.

Heeling, in navigation, a vessel leaning over. — Putting new heel-pieces to boots.

Heel-Tip, an iron plate or protection for the heels of boots and shoes.

Heer, a yarn measure; a heer of 24 cuts, or 240 threads, is 600 yards.

Heerabole, an Indian name for myrrh.

Heifer, a young cow.

Helaha, a tree in the Pacific islands, the seed of which is used to make necklaces.

Helbeh, an agricultural seed with a somewhat bitter taste, whose flour is mixed with dourah, or dhurra, by the laborers of Egypt.

Helicograph, an instrument for describing helices.

Heligoland, a small island in the North Sea, belonging to Great Britain, situate opposite to,

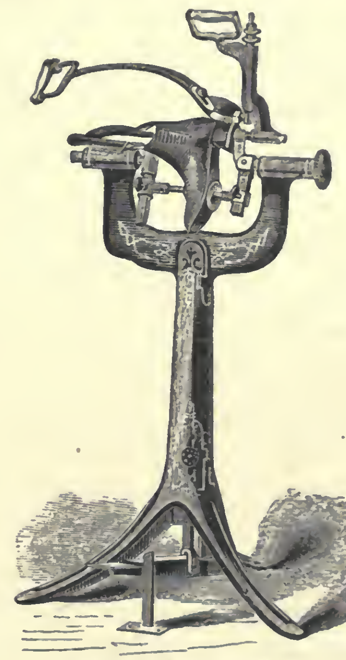

Fig. 265. — HEEL-TRIMMER.

and about 40 m. from, the mouth of the Elbe, in lon. 7° 51′ E., lat. 54° 11′ N. Including Sandy Island, it is about 2¾ m. in circumference. It is the most renowned of the North Sea bathing-places, and the inhabitants (about 2,000) live by fishing and by letting lodgings. Steamboats run between Heligoland and Hamburg.

Heliography, the name originally given by Nicéphore Niépse to the art of taking sun-pictures. See PHOTOGRAPHY.

Heliometer, a kind of telescope, with two object-glasses, for measuring the diameter of the sun, moon, and planets.

Helioscope, a telescope for viewing the sun through colored glass without injury to the eyes.

Heliostat, a philosophical instrument for reflecting an image of the sun into the telescope of a theodolite at a distant station · a train of clockwork so rotates a mirror that on being once adjusted it follows the sun's motion, requiring only winding and occasional adjustment to give a constant vivid station-signal when the sun shines.

Heliotrope, green quartz with blood-red spots and veins. *See* BLOODSTONE. — A popular plant, also called turnsole, *Heliotropium Peruvianum*, having a delicious odor, not unlike that of new hay. — An optical instrument used to reflect a ray of light to a distant station.

Hellebore Root, the rhizomes of several species of European herbs, of the genus *Helleborus* or *Veratrum*. The most important species is *H. niger*, the black hellebore, so called from the color of its roots, which are imported in bags and barrels from Hamburg, and are used in medicine as a drastic purgative. *Imp.* free.

Heliotype. See PHOTO-ENGRAVING.

Hellenotype, in photography, a picture in which two finished photographs are used. One is taken very light, the paper made translucent by varnish, tinted on the back, and laid upon the stronger print, so that there is a combination of effects. — *E. H. Knight.*

Hellier, a slater or tiler.

Helm, the tiller of a ship, but also applied to the collective apparatus or machinery by which a vessel is steered, comprising the rudder, wheel, tiller-ropes, etc. To put the helm *a-starboard*, is to put the tiller to the right side; *a-port*, to the left side; *up*, to the weather side; *down*, to the lee side.

Helmet, a horse-soldier's head-piece; a protection for the head. — The upper part of a retort.

Helmet-Shell, a common name for shells of the genus *Cassides*, which are used for cutting cameos from; the principal being *Cassis cornuta*, *C. rufa*, and *C. tuberosa*.

Helmsman, the man at the wheel who steers a ship.

Help, aid; assistance. — A hired servant.

Helpmate, an assistant.

Helve, the long handle of a tool.

Helve-Hammer, a large ponderous blacksmith's hammer for manufacturing wrought iron.

Hem, the border of a garment doubled and sewed over, to strengthen it and prevent the ravelling of the threads.

Hemadrometer, an instrument for measuring the velocity of the blood in the arteries.

Hematin, the coloring principle of logwood.

Hematite, a rich ore of iron, of which there are several varieties, the red, black, purple, brown, etc.

Hematosin, the red coloring matter of blood; in its dried state it is sold for making Prussian blue.

Hemi, a Greek word used as a prefix, signifying half.

Hemlock, the fresh and dried leaf of the wild herb *Conium maculatum*, or spotted hemlock. The first is used to make the extract; the last, the tincture and powder. *H.* is a powerful narcotic acrid poison, occasioning stupor, delirium, paralysis, convulsions, coma, and death. In small doses it is anodyne, alterative, resolvent, antispasmodic, and anaphrodisiac, and has been exhibited in cancer, dropsy, epilepsy, rheumatism, scrofula, syphilis, and other diseases. *H.*, whether in leaf or powder, rapidly deteriorates by keeping. Imp. duty: seed and leaf, free; extract, 40 per cent.

Hemlock Bark, the bark of the Hemlock Spruce, *Abies canadensis*, a tree which forms a great part of the forests of our Northern States and of Canada. Its timber is not much esteemed, as it splits very obliquely, and decays rapidly in the atmosphere; but its bark, although inferior to oak bark, is largely used in tanning. It is usually cut into lengths of 4 feet, and is sold by the cord. An *extract* of *H. B.*, used for the same purpose, is extensively manufactured in the State of New York and in Canada. *Imp.* duty: bark free; extract, 20 per cent.

Hemlock Gum, a name sometimes incorrectly given to Canada pitch.

Hemmer, a sewing-machine attachment used for turning over the edge of a piece of fabric so that the flap may be stitched down.

Hemmel, a shed or hovel for cattle.

Hemming, Himming, a shoe or sandal made of raw hide.

Hemp [Fr. *chauvre;* Ger. *Hanf;* It. *canape;* Russ. *konapli, konopel;* Sp. *canamo*], a valuable plant (*Cannabis sativa*) of the nettle tribe, remarkable for the tenacity, durability, and elasticity of its fibres. It grows in Eastern countries, and from a remote period has been distributed over the N. E. of Europe. At present it is reared principally in Russia and Poland, and in Italy near Naples. The plant is graceful in form, rising in northern latitudes to the height of 5 or 6 feet, and on the fertile soils of warm countries to 12 feet. It prefers a rich vegetable soil, and possesses the anomaly of growing upon the same spot for successive years without degeneracy. The seed is

Fig. 266. — HEMP.

sown in northern countries toward the end of April or beginning of May, and the plant is pulled in autumn. Being diœcious (that is to say with male and female flowers on different plants), there are two harvests; the first, of the male plants after they have discharged their pollen; the second, of the female, or seed-bearing plants, about a month later, when the seeds are ripened. The former is distinguished from the latter by its numerous flowers. After being pulled and dried (the female plants being besides slightly thrashed in order to separate the capsules from the stems), *H.*, like flax, is subjected to a steeping or water-rotting process, in order to destroy the texture of the glutinous substance which connects the fibres to the woody part of the stem. Sometimes the steeping process is omitted, and the *H.* is simply dew-rotted, by being exposed, spread out on the ground, to the influence of rain and moisture. When the fibres have been softened, or rather the glutinous substance softened, by rotting, the stalks are taken up, dried in the open air or in the sun, and sometimes in heated rooms. All the subsequent processes are so nearly like those from flax that it

will suffice to refer to the article FLAX for an account of them, — so far, at least, as concerns the use of *H.* in making textile fabrics; such as canvas, bagging, sacking, sail-cloth, tarpaulin, tent-cloth, marquee-cloth, etc. Jute is becoming a formidable rival to *H.* and flax in various manufactures. *H.*, however, maintains its superiority for many kinds of cordage (see ROPE).

H. was introduced in the North American colonies soon after their settlement by the English. It is mentioned as growing in New England prior to 1632; and bounties were offered for its cultivation in Virginia as early as 1751. It was extensively raised in the U. States during the first half of this century; but the importation into this country, in yearly increasing quantities, of a variety of other vegetable substances of the same nature, and applied to the same purpose, as coir, Manilla *H.*, jute, etc., has utterly discouraged the production of *H.*, and the *H.* crop, which once amounted to 30,000 tons in Missouri and Kentucky only, has fallen even there to insignificant figures. Our importation of *H.*, which was chiefly from Russia, has been also almost entirely discontinued. In the official reports for the year 1878 the importation of raw *H.* figures for 20,503 tons, valued at $2,221,164; but in this total are included India, Manilla, and like substitutes for hemp; and it is evident, for instance, that its 19,403 tons, valued at $2,047,147, imported from Spanish possessions, consist of Manilla *H.* imported from the Philippines. See COIR, JUTE, MANILLA *H.*, etc.

Indian H. Two plants are popularly so called. The Indian *H.* or *sunn*, used for cordage, is the fibre of the *Crotolaria juncea*, a totally different plant from the *Cannabis sativa*, which is never used by the Hindoos for cloth or cordage. Sunn is grown in various places of Hindostan. The strongest, whitest, and most durable species is produced at Comercolly. Though deficient in toughness, it is imported to some extent into this country through England. — The Indian *H.*, which is so highly prized for its narcotic virtues, is considered by some botanists as identical with, and by others as a distinct variety of, the common *H.*, *Cannabis sativa*. This herb, and the resin obtained, are largely employed in Asia, and in some parts of Africa and S. America, for the purposes of indulgence. The whole plant dried is known by the name of *gunjah* in the markets of Calcutta. The largest leaves and seed-capsules separated from the stalks are called *bang*, *subjee*, or *sidhee*. The tops and tender parts of the plants, collected just after the flowering-time, are in some places sold under the name of *hasheesh*. The dried flowers, called *kief* in Morocco, contain so much of the narcotic principle that a small pipe filled with them, if smoked, will suffice to intoxicate. The dried pistils of the flower enter into the composition of the Turkish *madjoun*. The resin which naturally exudes from the leaves and flowers, when carefully collected by hand, is known as *momeea*; the same, when beaten off with sticks, is sold under the name of *churrus*. An extract obtained by the use of butter, when mixed with spices, forms the *dawamese* of the Arabs, and is the foundation of the *hasheesh* of many Eastern countries and districts. The dried plant is smoked, and sometimes chewed. Five or ten grains reduced to a powder are smoked from a common pipe along with ordinary tobacco, or from a water-pipe with a peculiar variety of tobacco called *tombeki*. The resin and resinous extract are generally swallowed in the form of pills or boluses. The hemp-plant and its preparations appear to have been used from very remote times. The effects of the natural resin, or *churrus*, have been carefully studied in India by Dr. O'Shaughnessy. He states that when taken in moderation it produces increase of appetite and great mental cheerfulness, while in excess it causes a peculiar kind of delirium and catalepsy. The effect produced by hemp in its different forms varies, like that of opium, both in kind and in degree, with the race of men who use it, and with the individual to whom it is administered. Upon Orientals its general effect is an agreeable and cheerful character, exciting them to laugh, dance, and sing, and to commit various extravagances. It, however, renders some excitable and quarrelsome, disposing them to acts of violence. In this country its action is less marked. It is largely used in medicine in the form of extract or tincture.

Imp. duty: raw *H.*, also India, Manilla, and like substitutes for *H.*, $25 per ton. — All unenumerated manufactures, wholly or partly of *H.* (*H.* chief value), other than such as can be measured by the sq. yard 30 per cent. See BAGGING, CARPETING, LINEN, etc. — Indian *H.*, a crude drug, free.

Hempen, made of hemp.

Hemp-Seed [Fr. *chenevis*; Ger. *Hanfsaat*; It. *cannapuccia*; Russ., *kanopljanoe senja*], the seed of the hemp-plant, sold for feeding cage birds. A useful oil is obtained from it by expression, which is employed for paints, for lamps, and for making soft soap.

Hemstitch, a particular mode of sewing by drawing the threads of the fabric and separating them.

Henbane, the *Hyoscyamus niger*, a biennial herb which grows abundantly in the Southern States and in Michigan, and is cultivated in Europe for the medicinal properties of its leaves. The *H.* of commerce is chiefly imported from Manheim in balls of 175 lbs. *Imp.* free.

Henna, an East Indian coloring substance obtained from the shoots of the *Lawsonia inermis*. The Mohammedan women use it for dyeing the nails red; the manes and tales of the horses in Arabia are also stained red in the same manner. The distilled water of the flowers is used as a perfume.

Hen-Roost, a perch on which poultry roost at night.

Hepatic Aloes, a variety of the Socotrine aloes. See ALOES.

Heraldic Engraver, a die-sinker; a seal-engraver.

Herb, a plant with a soft or succulent stalk or stem, which bears its flower and fruit once only, and then with its root wholly perishes. There are two kinds: *annuals*, which perish the same year; and *biennials*, which have their leaves the first year, and their flowers and fruit the second, and then die away. The roots, stems, and leaves of many *H.* are used for culinary purposes; others are used in medicine and sold by druggists or herbalists.

Herbage, pasture for cattle.

Herbalist, one skilled in the properties of herbs; a dealer in medicinal plants, who supplies the trade and public.

Herbarium, a collection of dried plants.

Herd, to tend cattle, or take care of a flock; the person who looks after live-stock; a troop or body of cattle.

Herds-Grass, a name for timothy-grass, *Phleum pratense*. See HAY.

Herds, Hards, the refuse of flax.

Herdsman, a cattle-keeper.

Hereditaments, the stationary and immovable things inherited unless otherwise devised.

Hermetically Sealed, perfectly closed and impervious to air, as vegetables or fruits preserved in a soldered can.

Hereford Cattle. See CATTLE (NEAT).

Hermitage, a French wine, both white and red, and the most celebrated of the wines of the Rhône, grown in the department of the Drôme, near Valence. *H.* wine is styled by the French the richest colored in their great variety of wines, but it differs much with the seasons as to quality. Red *H.*, when it is of the first quality, is not bottled for exportation until it has been 4 or 5 years in the cask, in which, as well as in bottles, it is generally sold at that age. The price in the former case is high, even if the quality be moderate. In bottle the best sells for about 4 francs. The price of this wine is regulated by the quality, together with the demand for exportation, and not by the quantity or scarcity. It is fermented in large vats, but its treatment is not so perfect on the whole as that of some other French wines. The red contains 12.32 of alcohol, and the white 17.43. The white *H.* is made of white grapes only, and divided

into three growths. This is the finest white wine France produces. Its color should be straw-yellow; its odor is like that of no other known wine. It is of a rich taste, between that of the dry and luscious wines. It is often in a state of fermentation for two years, but is never delivered to the consumer, if it can be avoided, until fermentation is complete. It keeps much longer than the red, even to the extent of a century, without the least deterioration, though after 25 or 30 years old it assumes somewhat of the character of certain of the old Spanish wines, and its perfume and taste undergo a change. *Ermitage-paille*, or straw *H.*, is made from white grapes, carefully selected out of the most perfect and best. These are dried on straw for six weeks or two months, and then submitted to the press. But little is made, and that carries a very high price; for to obtain it in perfection, a season which brings the fruit to exact maturity is required, dry without cold, during the time the grapes are exposed on the straw. Ermitage-paille is a rich, luscious, sweet wine.

Hernant-Seeds, a commercial name for the seeds of a large East Indian tree, the *Hernandia ovigera*, exported to England for tanning purposes.

Herring [Fr. *hareng;* Ger. *Häring, Hering*], the *Clupea harengus*, a most valuable fish, both when fresh and when salted, ranked by Cuvier in the same order with the sprat, shad, anchovy, and white bait. The body is covered with scales, the upper part is blue or green according to the light, the lower part of a silvery white; ordinary weight 5½ oz., and length 10 to 12 inches; owing to the gill-lids being very loose and opening wide, it dies almost the instant it is taken out of the water.

The opinion, once entertained, that the proper home of the *H.* is within the Arctic Circle, and that its vast shoals issue thence at certain seasons, migrating southward, and spreading themselves along the shores of Europe, Asia, and America, is now discarded as utterly without foundation; and the *H.* is believed to be an inhabitant of deep water, from which, at certain seasons, it approaches the shores, probably never migrating to any great distance. The young are abundant in the shallow water near the shores at seasons when the parent fish are absent. The *H.* seems always to deposit its spawn in comparatively shallow water, and is said to be very indifferent whether the spawning-ground be sandy, rocky, or covered with submarine vegetation. Certain localities, however, have the reputation of being favorite spawning-grounds. When the great annual shoals of herrings appear on the coasts, they generally swim near the surface of the water, and are followed by multitudes of larger fishes, as hakes, dog-fishes, etc., which prey on them; great numbers also fall a ready prey to gulls and other sea-birds, which congregate for the occasion. The food of the *H.* is believed to consist chiefly of minute crustaceans and *acalephæ;* but it feeds also on small fishes, not scrupling to devour even the young of its own species. The immense multitudes of herrings annually taken by the net cause no apparent diminution of their abundance, the destruction being compensated for by prodigious fecundity; more than 68,000 eggs have been counted in the roe of a single female. But *H.*, without any apparent cause, often desert parts of the coast where for a time they have been remarkably abundant, not returning in similar plenty till after the lapse of a number of years. Such seems to be the case on our Eastern coasts. Until the last 30 years it frequented the harbors of Cape Cod in myriads from March till June; since that time it has become comparatively rare. *H.* are full of roe in the end of June, and continue in season till the beginning of winter, when they deposit their spawn. Though the produce of our fisheries is very large (see Sea Fisheries), *H.* are yearly imported from the Dominion of Canada and Newfoundland. The imports of pickled *H.* for the year 1878 amounted to 58,082 bbls., valued at $230,533. *Imp.* duty: pickled or salted, $1 per bbl., or 50 cts. per 100 lbs.

The mode of fishing for *H.* is by drift-nets, very similar to those employed for taking mackerel and pilchard, with a slight difference in the size of the mesh. The net is suspended by its upper edge from the drift rope by various shorter and smaller ropes called buoy ropes; and considerable practical skill is required in the arrangement, that the net may hang with the meshes square, smooth, and even in the water, and at the proper depth; for according to the wind, tide, situation of their food, and other causes, the *H.* swim at various distances from the surface. — The size of the boat used depends on the distance from shore at which the fishery is carried on; but whether in deep or in shallow water, the nets are only in actual use during the night. It is found that the fish strike the nets in much greater numbers when it is dark than when it is light; the darkest nights, therefore, and those in which the surface of the water is ruffled by a breeze, are considered the most favorable. It is supposed that nets stretched in the daytime alarm the fish, and cause them to quit the places where that practice is followed; it is therefore strictly forbidden. *H.* are brought to market in three forms: *fresh H.* are the condition in which they are taken from the sea; *white* or *pickled H.* are merely salted and put into barrels; *red H.* are gutted and salted, and afterwards hung up and fired with the smoke of green wood. Fresh *H.* are consumed in considerable quantities in towns adjoining the coast; but it is the pickled and red *H.* which form the great objects of the fishery. The *boat fishery* is that chiefly pursued when the fishing-ground is not at a great distance from the shore. The *deep-sea fishery*, where the fishermen go out to sea wherever the fish are to be found, requires vessels of a larger description (generally from 30 to 80 tons), as the *H.* are pickled and stowed on board. The vessels fitted out for this fishery commonly meet with the earliest and best *H.*; and owing to the circumstance of the fish deserting parts of the coast which they have been accustomed to frequent, it is a more regular source of profit than the boat fishery, though it requires larger capital.

At Yarmouth, which is the great seat of the English *H.* fishery, the fish are counted thus: the last of *H.* is 13,000; the barrel is 26⅔ and the cran 37½ Imp. gallons; a cade is 500 *H.*

Herring-Bone, a kind of cross-stitch in seams, mostly used on woollen work.

Herse, the French name for a harrow. See Hearse.

Herst-Pan, a frying-pan.

Hesp, in weaving, the length of two hanks of linen thread.

Hesse (Grand Duchy of), a central state in the W. of Germany, comprising two disconnected territories separated from each other by the Rhine, and bounded N. by the Prussian province of Hesse-Nassau, E. by Bavaria, S. by Baden, and W. by Rhenish Bavaria and Prussia. Area, 2,866 sq. m. The surface of the E. portion of both parts is mountainous. The country is fertile, and agriculture in a flourishing condition. Fruit is abundant, and the vine highly cultivated. The principal manufactures consist of damask, linens, silks, tobacco, earthenware, and chemicals. *H.* is divided into the 3 prov. of Upper *H.* (Oberhessen), Rhenish *H.* (Rheinhessen), and Starkenburg. *Darmstadt*, the capital, is situated on the River Darm, 15 m. S. of Frankfort-on-the-Main; pop. 44,088. The chief commercial city of *H.*, and next to Cologne the principal mart for Rhenish produce in Germany, is *Mayence* or *Mentz*, an old city, situated on the Rhine, near its junction with the Main, in lat. 49° 59′ 44″ N., lon. 8° 16′ 32″ E. Pop. 57,847. The government is a constitutional monarchy, the legislative power being vested, in part, in two chambers, called the Upper and the

Lower House of Representatives. The budget is granted for the term of 3 years by the chambers. The revenue for the financial period 1879–1881 was given at $5,476,781, and the expenditure at $4,576,858. The public debt, incurred mainly in recent years for the construction of a network of State railroads, amounted in 1879 to 25,382,000 marks, or $6,345,500. Pop. 884,218.

Fig. 267. — MAYENCE.

Hessian Boots, a kind of long boots.

Hessians, a coarse fabric of jute and hemp, used for bagging, and manufactured at Dundee, Scotland.

Hew, to cut by blows with an edged instrument; to shape with an axe.

Hewer, a worker in wood; a stone-mason; a collier; one who cuts or shapes the rough material.

Hexachord, a musical instrument with six strings.

Hhd., the commercial abbreviation for hogshead.

Hickory, a tree (*Carya*) growing on a large scale in many parts of the U. States. Several species are recognized, though no difference can be distinguished in their timber, which is cross-grained, red at the heart, heavy, and exceedingly tough and strong; but it is subject to be attacked by worms, and it decays quickly when exposed to the weather. It is chiefly employed for carriage-shafts and springs, large screws, chair-backs, hoops, whip-handles, and similar purposes. The *H.* is distinguished from the *Juglans* or true walnut by the shell of its nuts not being deeply furrowed. The nuts of one species (*C. oliveformis*), called pecan-nuts, are much esteemed as a table-fruit, and are also exported to some extent to England.

Hide [Fr. *peau;* Ger. *Häut;* It. *cuoja;* Port. *pelle;* Sp. *pellejo, piele*], signifies, generally, the skin of a beast, but the term is more generally applied to the skins of bulls, cows, horses, buffaloes, etc., which form an important branch both of our inland and foreign trade. Various kinds are distinguished. Raw or green hides are those in the state in which they are taken from the carcass; salted hides are those dressed or seasoned with salt, alum, or saltpetre, to prevent them from putrefying; and tanned or cured hides. The buffalo hide is larger and heavier than that of the ox, and is, besides, distinguished by a tuft of hair on the shoulders. Losh hides are buffalo and others dressed in oil in the same way as chamois skins. Muscovy or Russian hides are tanned and colored of a brown or red color. In commerce, *hides* is the name for the skins of the large animals above enumerated, and *skins* for the finer pelts. The *H.* of S. America are in the highest repute, and vast quantities of them are imported. *Imp.* free.

The exports for the year 1878, chiefly to Canada, England, France, and Germany, amounted to $1,286,840. See FUR and LEATHER.

Table of the Foreign Imports of Raw Hides and skins into the U. States for the year 1878.

Whence imported.	Value.	Whence imported.	Value.
Argentine Rep....	$3,380,747	British Poss. Africa	$209,727
Belgium..........	251,164	Mexico..........	1,565,546
Brazil............	1,288,085	Dutch W. Indies..	172,681
France...........	361,370	U. S. of Colombia	1,401,347
Germany.........	228,301	Uruguay.........	1,571,729
England..........	2,923,576	Venezuela........	700,393
Canadas..........	362,654	All other countries	786,900
British East Indies	2,039,144	Total	$17,223,363

Hide Cuttings, in the leather manuf., the trimmings of raw hides, which are sold for making glue.

Hide-Rope, rope made of strands of cowhide plaited, which is very durable, and used for wheel-ropes, traces, jigger and purchase ropes.

Higgler, a chafferer; a travelling dealer in provisions or small wares.

Higgling, chaffering; tedious in bargaining.

High, dear; costly; above the usual prices.

High 'Change, the moment of the day at which the largest number of merchants are found on 'Change.

High Figure, at the full value, or above the market price.

High-pressure Engine, a steam-engine in which the steam is not condensed, but admitted into the cylinder at a very high temperature, and therefore an exceedingly strong boiler is required.

High-Road, a public way for vehicles, etc. See HIGHWAY.

High Seas, the water of the ocean without the boundary of any country, and they are within the exclusive jurisdiction of the admiralty up to high-water mark, when the tide is full. The open ocean which washes the sea-coast is used in contradistinction to arms of the sea enclosed within the *fauces terræ*, or narrow headlands or promontories; and under this head are included rivers, harbors, creeks, basins, bays, etc., where the tide ebbs and flows. They are within the admiralty and maritime jurisdiction of the U. States; but if they are within the body of a county of any particular State, the State jurisdiction attaches.

High-seasoned, flavored with spices or other seasoning.

High-Water, the highest state of the tide; the turning point just before the ebb commences. See TIDE.

High-water Mark, the mark made on the shore when the tide is at its highest.

Highway, a public thoroughfare, or road, for traffic. It is a settled principle in the English law, that the right of soil of owners of land bounded by the sea, or on navigable water, where the tide ebbs and flows, extends to high-water mark; and the shore below common, but not extraordinary, high-water mark belongs to the State as trustee for the public; and in England the crown, and in this country the people, have the absolute proprietary interest in the same, though it may, by grant or proscription, become private property. The public have, at common law, a right to navigate over every part of a common navigable river, and on the large lakes. The public, in cases where the river is navigable for boats and rafts, have an easement therein, or right of passage, subject to the *jus publicum*, as a public highway. Each proprietor is entitled to a larger or smaller proportion of the alluvial formation and shore line, according to the extent of his original line on the shore of the river. In the case of rivers not navigable, it belongs to the owners of the adjoining land. This principle of the common law is recognized and prevails in the States of Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Maryland, Ohio, Virginia, North Carolina, Louisiana, etc.

High Wines, a proof kind of spirit in distillation, contradistinguished from low wines.

Hilt, the upper part of a sword or other weapon or tool.

Himt, an old German corn measure, varying in different localities. It ranges from 5¾ up to nearly 10 gallons. In Hanover 96 himtens are equal to 82 bushels.

Hina, the name for a gourd or melon in the Pacific islands.

Hind, the female of the red deer, of which the male is the stag. — A farm servant; a peasant.

Hing, the East Indian name for asafœtida; hingra being the coarsest kind of the drug.

Hinges, movable metal ligaments, or connected plates, for the joints of doors, gates, etc., to turn on. See BUTTS.

Hink, a reaping-hook.

Hip-Knobs, ornaments at the gable end of houses.

Hippocras, an aromatic cordial or spiced wine, formerly in high repute in England.

Hippodrome, a circus for feats of horsemanship.

Hippopotamus-Hides. The tanned skin of this pachyderm is used by mechanical engineers, and also formed into shields and other articles.

Hip-Strap, a strap which, crossing the buttocks of a horse, supports the breeching or the traces merely, according to the style of harness.

Hire, wages or compensation for services.

Hirling, a small sea-trout like a salmon, with reddish flesh.

Hirsell, a flock of sheep; the act of classing or sorting into breeds or flocks.

Hirst-Frame, in forging, the frame of a tilt-hammer.

Hissa, an Indian term for a share or division.

Histrionic, a dramatic performer.

Hitch, a knot or noose in a rope for fastening it to anything, of which there are many kinds: as a half-hitch, clove-hitch, Blackwall-hitch, magnus-hitch, timber-hitch, etc. — A slip (see Fig. 85, in article COAL).

Hive, a box or rush basket for a swarm of bees to lodge and work in; commonly called bee-hive.

H. M. C., H. M. S., abbreviations for "her Majesty's customs — her Majesty's ship — her Majesty's service."

Ho, a Chinese measure of capacity, about 7⅔ gallons.

Hoarding, a boarded enclosure or fence, fixed about any building which is being erected or repaired. — The act of accumulating or saving.

Hoastman, a coal-fitter, one who vends coals at a seaport.

Hob, the flat iron projection at the side of a fire-grate. — The nave of a wheel. — A boor.

Hobart-Town. See TASMANIA.

Hob-Nail, a clout-nail; a short nail with a large head, used for nailing strong country boots.

Hock is a name loosely applied in England to all German wines, either still or sparkling, from Hockheim, the place near which is grown the celebrated Hockheimer wine.

Hockheimer. See GERMANY (WINES OF).

Hod, a bricklayer's or plasterer's box or tray, fixed at the end of a staff, in which to carry bricks and mortar on the shoulder.

Hodden Gray, cloth made of wool in its natural state, without being dyed.

Hodge-Podge, an Irish stew; a mixture of vegetables and meat.

Hodman, the bearer of a hod; one who carries mortar or bricks in a hod to other workmen on a building.

Hoe, an agricultural instrument of iron, for farm or garden use, employed to turn up weeds, and loosen the soil round plants. The hand-*H.* is a thin plate of iron 6 to 8 inches broad, and sharpened on the edge fixed at right angles on the extremity

of a pole or rod, which serves as a handle. This is called a *draw-H.*, because in the operation of hoeing the instrument is drawn or pulled toward the operator. Another kind of garden *H.* has the blade or iron plate fixed on the extremity of the handle, and in continuation of it; and this is called a *thrust-H.*, because in hoeing the operator always pushes the *H.* forward. This kind is also called the *Dutch H.*, most probably from having been first introduced from Holland. In agriculture, *H.* of the thrust kind are drawn by beasts of burden,

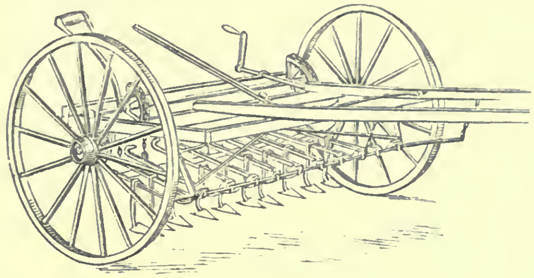

Fig 268. — Bucknall's Horse-Hoe.

and commonly called *horse-H.*, or *hoeing-machines.* In general form they resemble a plough; but instead of the share they have one or more iron blades or plates with sharp edges, fixed to perpendicular iron rods at their lower extremities. These sharpened plates, being drawn through the soil, cut through the roots of weeds an inch or two beneath the surface. Agricultural or field *H.* are only used in the case of those field crops which are sown or planted in rows. There are a great many kinds of field or horse *H.*, chiefly differing in the number of blades which are attached to the common frame for stirring and cleaning a greater or smaller number of spaces between the rows of drilled crops at once. Fig. 268 represents the English Bucknall's horse-*H.*, which is used for hoeing wheat.

Hoe, Hoigs [Scotch], stockings; hose.

Hoffman, a fire-insurance Co., located in New York City, and organized in 1864. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $78,847.09; risks in force (fire), $13,426,-881; premiums (fire), $134,539.81; inland, $2,500; premiums, $125; premiums received since the organization of the Co., $1,962,635 29; losses paid, $1,249,395.54; cash dividends paid to stockholders, $130,000.

Hog, a well-known animal of the swine family, whose flesh, called *pork*, constitutes one of the most important articles of our national commerce, both domestic and foreign.

Of all quadrupeds the *H* is the most gross in his manners, and therefore has been regarded as the very personification of impurity. The Jews were strictly enjoined not to eat its flesh; and the Mohammedans agree in this respect with the Mosaic prohibition. In most parts of Europe and America, however, it constitutes a very material part of the food of mankind. The *H.* is an animal of a remarkably prolific nature; and as they bring forth from 10 to 15, and sometimes 20, at a litter, they would soon become very numerous, were they not diminished for the support of man. Their flesh, says Linnæus, is wholesome food for persons of athletic constitutions, — those who habituate themselves to much exercise, — but improper for such as lead sedentary lives. It is, however, an article of general consumption, and one which is of great importance to a naval and commercial nation, as it takes salt better than any other flesh, and consequently is capable of being longer and more easily preserved than any other. The Jews and the Mohammedans not only abstain from the *flesh* of swine from a religious principle, but even consider themselves defiled by touching it The Chinese, on the contrary, are so excessively fond of pork that many, owing to this partiality alone, as it is said, have been prevented from conversion to Mohammedanism. The *fat* of swine differs, in its situation, from that of almost every other quadruped, as it forms a thick, distinct, and continued layer betwixt the flesh and the skin *Lard*, which is chiefly obtained from the fat membranes of the abdomen, is applicable to various uses, both culinary and medicinal; and when good is white and moderately hard. The *skin*, when properly dressed, is used for the seats of saddles; it is also employed by various artificers Great attention has been paid in this country to the improvement of the various breeds; and by judicious crosses much has been effected both as to quality and size. Swine were probably introduced from Spain into Hispaniola by Columbus in 1493, into Florida by De Soto into 1538, into Canada in 1608, and into Virginia in 1609, where they multiplied so rapidly that in 18 years the people were obliged to palisade Jamestown to keep them out. Different breeds are prized in different districts, according to the fancy of producers, the facility of raising them, and the particular object of the farmer The Chinese *H* (Fig. 269), both the white and black varieties, are easily fattened, and have small bones; indeed, they are generally too fat to be esteemed as pork, and are considered to make poor bacon. Bred carefully, and mixed with other stock, they are valuable animals. The Neapolitan is the most celebrated of the Italian breeds, doubtless descended from the improved varieties of ancient Rome, and the stock of most of the English breeds. Though not very hardy, the flesh is of superior quality. It is small, black, with few bristles, short snout, erect ears, and small bones. Crossed with the Berkshire breed, the form is improved and the constitution hardened, with a remarkable tendency to fatten easily. The Berkshire (Fig. 270), an English breed, black or white, is larger than the Neapolitan, with more bristles, and less fat to the meat, which is well suited for bacon and hams. This was formerly preferred above all others in many parts of New England; but its cross with the Chinese is more profitable, as the weight is heavier with light feeding, and the disposition milder. The Essex, crossed with the Neapolitan, is one of the most valuable, and has taken more prizes in England than any other breed. It is black, of good size and symmetry, mild disposition, easily fattened, the meat of excellent quality, and the dressed weight at 12 and 18 months 250 to 400 lbs. It is not subject to cutaneous diseases. The Irish grazier is slow in coming to maturity; but crossed with the Berkshire is an excellent variety. The Woburn or Bedford breed was originally sent by the Duke of Bedford to General Washington, and was produced at Woburn, England, by a cross of the Chinese boar and a large English *H.* When pure they are white, with dark ash-colored spots. They are of large size, with deep, round bodies, short legs, and thin hair, easily kept, and maturing early. The Middlesex is a popular breed in England, and has

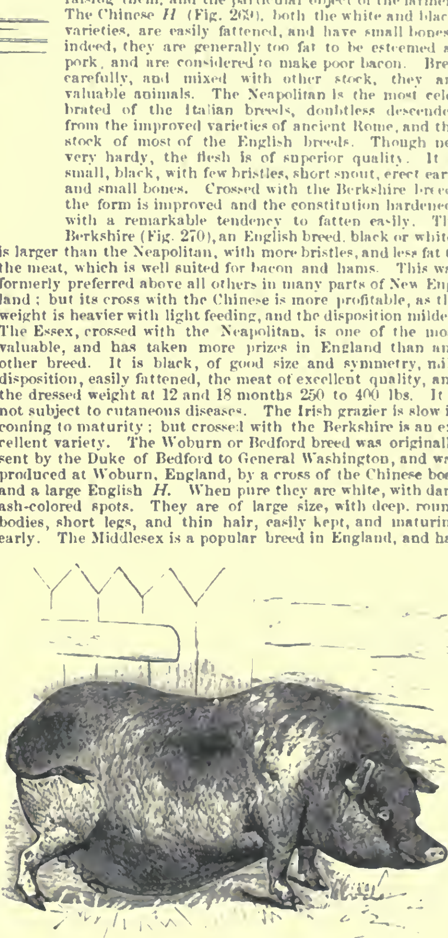

Fig. 269. — Chinese Hog.

been considerably imported into the U. States. It is derived from a mixture of the Chinese with some larger stock The color is usually white, and the size larger than the Suffolk, weighing at 18 months 800 to 900 lbs. The bones are smaller than in the Essex. But the favorite of all breeds seems now to be the Suffolk, so named from that county in England, whence the London market has long been supplied. The present breed is believed to have originated from the old Suffolk crossed with the Chinese and Berkshire. The pure breed is remarkably symmetrical, small and compact, short-legged, and small headed, the exact opposite of the long, lank, and lean *H.* of the western prairies. Their early maturity, small consumption of food, and tendency to fat, compensate for their want of size. The color is white. These are the most esteemed varieties. There are many others, imported and domestic, which

thrive well in peculiar districts, and which are more or less extolled by their respective fanciers. While *H.* are kept in New England and the Middle States mostly in pens, in the West they are allowed to range in the woods and fields till within 3 months of the time of killing them, feeding upon clover, corn, acorns, and mast. The number of *H.* in the U. States in 1878 was as follows: —

States.	Hogs.		
	Number.	Average price.	Value.
Maine	62,200	$7.74	$481,428
New Hampshire	42.900	12.72	545,688
Vermont	54,300	8.00	434,400
Massachusetts	78,600	13.86	1,089,396
Rhode Island	18,100	13.55	245,255
Connecticut	59,500	11.60	690,200
New York	975,000	8.36	8,151.000
New Jersey	154,400	8.88	1,371,072
Pennsylvania	937,200	8.05	7,544,460
Delaware	47.600	7 70	366,520
Maryland	259,600	5.62	1,458,952
Virginia	759,200	3.96	3,006,432
North Carolina	1,180,000	3 75	4,425,000
South Carolina	450,000	3 49	1,570,500
Georgia	1,586,900	3 29	5,220,901
Florida	190,000	2 59	492,100
Alabama	952,300	3.26	3,104,498
Mississippi	1,284.400	3.34	4,289,896
Louisiana	350,000	4.11	1,438,500
Texas	1,716,700	3.67	6.300,289
Arkansas	1,040,300	3.65	3,797,095
Tennessee	1,900,000	4 06	7,714,000
West Virginia	281,500	4.15	1,168,225
Kentucky	1,950,000	5.13	10,003.500
Ohio	2,250,000	5 86	13,185,000
Michigan	556,100	6 08	3,381.088
Indiana	2,422,500	5.18	12,548,550
Illinois	2,000,000	5.89	17,081.000
Wisconsin	635,300	5.67	3,602,151
Minnesota	180,000	5.29	952,200
Iowa	2,950,000	5.42	15,989.000
Missouri	2,585,600	4.12	10,652,672
Kansas	431,700	5 96	2,572,932
Nebraska	255,700	5.80	1,483,060
California	438,500	6.27	2,749,395
Oregon	198,100	3.67	727,027
Nevada	10,800	7.00	75,600
Colorado	12,500	7 50	93,750
The Territories	105,000	7.96	835,800
Total	32,262,500	$4.98	$160,838,532

Our exports of living *H.* for the year 1878, chiefly to Canada and England, amounted to 29,281, valued at $267,259.

The *H* is fed for two purposes. The one is to yield pork, which may be used either fresh, salted, or pickled, and for which the pigs are ready in 6 or 8 months; the other is to produce bacon, prepared by salting and drying the flesh, and for which they are ready in 10 or 12 months. The smaller class of early feeding pigs is preferred for the former purpose,

Fig. 270. — Improved Berkshire Hog.

the larger class for the latter In the case of pickling pork, the carcass is cut into pieces, and packed in kits, barrels, or cases. When designed for bacon, the body is cut so as to separate the hams or legs from the flitches, or sides. The pork-packing business is carried on to a great extent and with admirable system at Cincinnati and other Western cities, and on a scale of almost incredible magnitude at Chicago, where about 30.000 *H* per day are slaughtered, converted into hams, bacon, and pork, and packed or pickled, ready for exportation, during the winter months. See Chicago (Pork-Packing).

The following table exhibits, by States, for the seasons of 1877–78 and 1876–77, respectively, the number of *H.* packed between November 1st and March 1st, the average net weight, total product of lard, the average prices paid per hundred pounds net, the aggregate cost, together with the grand aggregates and general averages of the West, in a period of eight years. The table is taken from the Report of the Chamber of Commerce of Cincinnati issued in 1879.

States.	Number of Hogs.		Average Net Weight.		Total Product of Lard in lbs.		Average price per 100 lbs., net		Aggregate Cost	
	1877–78.	1876–77	1877-78.	1876-77.	1877 78.	1876-77	1877-78.	1876-77.	1877-78	1876-77
Ohio	934,132	813.709	223.85	218.15	36,433,045	29.699,759	$5.15	$7.20	$10,767,520	$12,778,260
Illinois	2,714,748	1,905,219	229 57	218.09	107,863,411	67,052,519	5.10	7.42	31,787,339	30,812.167
Indiana	496,025	530,286	214.32	199 41	17,074.584	15.741,419	4.93	7 02	5,238.287	7,419.140
Iowa	486,850	419.442	220 53	207.75	18,163,957	13,949,594	4.48	6.82	4,809 391	5,939,740
Kansas	41,470	31.775	267.48	240.41	1,750,248	1,180,875	4.36	6.61	484,200	505.086
Kentucky	318,301	255,986	223 72	222 52	11,041,100	8,472,941	5 35	6.99	3,807,673	8,980,326
Michigan	120,095	88,689	234.88	232.35	4,436.078	2.911,558	4.83	6.92	1,363,759	1,425,441
Minnesota	23,700	24,235	261.10	249.94	1,045,500	710,007	4.42	6.49	254,957	393,217
Missouri	804.614	644,699	219 74	213.93	31,478.408	21.844,196	4.82	7.05	8,527,150	9,719.261
Nebraska	56,000	46,190	232 28	220.39	2,672,000	1,755,420	4.40	6 78	571,932	697,581
Tennessee	66,897	50,770	208 65	208.04	2,112.993	1,598,412	5.03	6 74	701,817	711.972
Wisconsin	412,614	266.861	236.51	226.67	16,148,375	8,201.780	4 83	7.11	4,710,708	4,302,555
West Virginia	14,000	10.947								
Pittsburgh, Pa.	13,000	10,000	215 33	213.7	973,801	759,410	5.31	7 16	343.479	355,690
Atlanta, Ga.	3,000	2,500								
Totals	6,505,446	5,101 308	226.04	215.92	251,193,500	173,877,890	$4 99	$7 18	$73,368,272	$79,040,436
Grand Totals.										
1877–78	6,505,446	....	226.04	......	251,193,500	....	$4.99	....	$73,368,212	....
1876–77	5.101.308	....	215.92	......	173,877,890	....	7.18	....	79 040,436	....
1875–76	4,850,192	....	......	......	174,803 333	....	....	....	93,422,543	....
1874–75	5,537,124	....	......	......	193,432,170	....	....	....	96,749,250	....
1873–74	5,383,810	....	......	......	191,139,000	....	....	....	63,370,339	....
1872–73	5,456,004	....	......	......	218,655,238	....	....	....	59,841,163	....
1871–72	4,782,403	....	......	......	184,552,627	....	....	....	55.818.711	....
1870–71	3,623,404	....	......	......	136,653,181	....	....	....	65,518,123	....

Statement showing the number of Hogs packed in the six principal cities of the West, together with the average yield of Lard of all kinds, and gross price for three winter seasons.

Cities.	Number of Hogs.			Average Gross Weight.			Average yield of Lard, all kinds.			Average cost per 100 lbs. gross.		
	1877-78.	1876-77.	1875-76.	1877-78.	1876-77.	1875-76.	1877-78.	1876-77.	1875-76	1877-78.	1876-77.	1875-76.
Cincinnati....	632,302	523,576	563,359	284.06	274 71	273 68	40.96	38.2	37.8	$4 19 83	$5 90.18	$7 27.53
Chicago......	2,501.285	1,618,084	1,592,065	285.46	269.96	271.65	39.6	35.1	36 32	4 12	6 00	7 21
St Louis	509,540	414,747	329,895	270.02	258.02	268 47	38.2	32.55	36.56	3 96	5 70	7 17
Indianapolis..	270.150	294,198	223,147	244.29	228.12	268	32.05	26.5	32 4	3 94	5 84	7 35
Milwaukee....	371,982	225,598	323,184	290 8	277.16	251 25	39 81	30.25	30.66	3 90	5 80	7 10
Louisville.....	279,414	214,862	181,972	278.61	276.4	255 29	34.83	32.62	30.63	4 35	5 64	7 00.8
Total.......	4,564,673	3,291,065	3,213,622	281.18	266 38	268.45	38 91	34	35 44	.....	.....	$7 20 6

Statement showing the quantities and value of Hog Product exported from the U. States during the year 1878.

Countries to which exported.	Pork.		Bacon and Hams.		Lard	
	Pounds.	Value	Pounds.	Value.	Pounds.	Value
Great Britain — England............	20.153,360	$1,548,733	370,806,395	$33.806,885	89,772,593	$7,934,320
Scotland............	1,975.093	160,269	46,677,393	4,376,066	24,712,118	2,241,155
Ireland	2,200	121	983,755	58.700	....	....
Germany	702,900	49.961	28,022,987	2,201,208	85,352,594	7,413.937
France	599.969	42,523	55,280,429	4,161.468	50,465,990	4,274.074
Belgium............................	79,200	5,647	52,816,530	4,013,423	28,039,084	2.463.499
Netherlands	90.320	5,940	5,465,407	409,906	7,325,831	612.674
Sweden and Norway..................	17,000	1,241	10,324,365	626,671	252,064	19,588
Denmark	....	......	1,490,779	102,665	2,895,618	241.588
Other countries in Europe...........	98,400	10.076	355.495	29,036	844.921	70,324
Cuba	390,405	26,750	10,800,984	938.492	23,153.687	1,850,211
Hayti	14,241,051	905,254	300,111	38,716	1,133,968	117,302
Porto Rico..........................	2,527,965	159,737	680,883	75,761	2,598.759	245,150
Other West India Islands............	9,692,690	659,862	1,829,938	188,794	3,107,775	292.842
Mexico	16,940	1,127	141,505	16,565	1,255,063	137,119
British Guiana......................	2,812,628	184,632	297,711	28,281	838.926	72,643
United States of Colombia	560,580	40,512	62.489	7,286	5,708,423	531.471
Central American States.............	155,932	9,538	80,638	7,763	97,334	9,771
Brazil............................	50,900	3,643	37,503	3,255	5,715.720	604,999
Chili..............................	90.000	4.864	778	105	1,390.850	127.160
Peru	26,840	1,476	8,889	654	905,765	85,196
Venezuela	65 943	5,390	311,192	39,228	2,872.837	279,710
Other S. American countries.........	2,600	169	8,122	889	628,531	67.529
Quebec, Ontario, N. W. Ter.	10,628.704	648,163	5,247,917	523,398	2,550,135	210,318
Canadian Maritime Provinces.........	5,779,070	361,853	192.808	18,535	383,785	37,580
British Columbia	17.800	1.542	256,599	33,634	101,248	13,741
China, Japan, E. Indies, etc.	198.015	14.341	105.596	14.979	96,959	9,292
Africa and adjacent islands	465.338	29,872	31,090	3,892	274,970	28,266
Hawaiian Islands..................	22,437	1,813	95,515	13,102	36,094	4,440
All other countries................	424,975	28,608	100,548	12,710	156,278	15,355
Totals — 1878....................	71.839,255	$4.913,657	592,814,351	$51,752,068	342,667.920	$30,014,254
1877....................	69,671,894	6.295,414	460,057,146	49,512,412	234,741,233	25,562,665

Hog-Fleece, the clip of wool from a sheep that has not been previously shorn.

Hog, a young sheep that has not been shorn: hence the terms ewe-hog, wedder-hog, and tup-hog.

Hogged, a term applied to a ship, which, through some defect or strain, droops at each end.

Hogger-Pump, the top pump in the sinking-pit of a mine.

Hoggers, stockings without feet, worn by coal-miners when at work.

Hogget, abbreviated into hog, or tup-hog; a weaned male sheep; if castrated, he is called a wether-hog.

Hog-Pen, a pigsty or enclosure for swine.

Hogshead, a measure of capacity for wine and other measures, containing 63 gallons, or two barrels. Also a large cask used for transporting various articles, as sugar, molasses, tobacco, etc., ranging from 750 to 1,800 lbs. in weight.

Hog-skin-Gloves, heavy gloves made from the tanned skin of a variety of hog from South America.

Hog-skin-Saddle, a superior kind of saddle made in Scotland from the tanned skin of the common hog.

Hoist, to lift up.

Hoisting-Machine, any machine or contrivance for hoisting merchandise or passengers; a block; a capstan; a crane; a derrick; an elevator; a pulley; a windlass; etc.

Hoistway, a square opening in the floors of ware-rooms for the convenient raising or lowering of merchandise, perpendicularly, from the lower to the upper or from the upper to the lower stories. *T. McElrath.*

Hoja-de-Lata [Sp.], tinned iron, — *hoja-de-laton* being sheet brass.

Hold, the whole interior of a vessel below the decks; the space where the cargo is stowed.

Holdfasts, flat-headed nails.— Stout, bent pieces of iron; catches or clamps for driving into walls, etc., as supports for attached pieces.

Hold-Water, staying the progress of a boat by keeping the oars submerged.

Holidays are understood to be those days, exclusive of Sundays, on which no regular public business is transacted at particular public offices. They are either fixed or variable. Banks and public offices are only closed on fixed holidays. In England the holidays observed generally are, Good Friday, Queen's Birthday, Coronation Day (June 28), Prince of Wales's Birthday (November 9), Christmas. In the United States the holidays are, Fourth of July, Thanksgiving Day (November), Christmas. At New York and some other cities New Year's Day is also observed, and at New Orleans, January 8th.

Holing, undermining coal-beds. — Dibbling in plants.— Digging trenches to plant pieces of sugar-cane.

Holland, or **Kingdom of the Netherlands**, a maritime kingdom of Central Europe, situated between lat. 50° 46′ and 53° 34′ N., and lon. 3° 27′ and 7° 14′ E., and bounded W. and N. by the German Ocean or North Sea, S. by Belgium, and E. by Germany, from which it is not separated by any natural barriers. *H.* comprises the territory of the ancient republic of the Seven United Provinces, with some portions of Limburg. The government is a constitutional monarchy. The present constitution, solemnly proclaimed Nov. 3, 1848, vests the whole legislative authority in a parliament composed of two chambers, called the States-General. The Upper House, or first chamber, consists of 39 members, elected by the provincial states from among the most highly assessed inhabitants of the various counties. The second chamber of the States-General, elected by ballot, at the rate of one deputy to every 45,000 souls, numbered 86 members in 1878. All citizens, natives of the Netherlands, not deprived of civil rights, and paying assessed taxes to the amount of not less than 20 guilders, or $8.25, are voters. Clergymen, judges of the Hooge Raad, or High Court of Justice, and governors of provinces are debarred from being elected. Every two years one half of the members of the Second Chamber, and every 3 years one third of the members of the Upper House, retire by rotation. The sovereign has the right to dissolve either of the chambers separately, or both together, at any time, but new elections must take place within 40 days. The Second Chamber alone has the initiative of new laws, together with the government, and the functions of the Upper House are restricted to either approving or rejecting them, without the right of inserting amendments. The king has full veto power, but it is seldom, if ever, brought into practice. Alterations in the constitution can only be made by the vote of two thirds of the members of both Houses, followed by a general election, and a second confirmation, by a two-thirds vote, of the new States-General. The executive authority is, under the sovereign, exercised by a responsible council of 8 ministers. The Hague [Dutch, *Gravenhaag*; Fr. *La Haye*], a fine city at 13 m. N. W. of Rotterdam, is the residence of the court and seat of government. *H.* is divided into 11 provinces, the area and population of which were as follows on Jan. 1, 1880: —

Provinces.	Area in sq. m.	Population.
North Brabant	3,205	457,709
Guelderland	3,154	453,624
South Holland	1,869	763.636
North Holland	1,706	642,073
Zealand	1,101	187,046
Utrecht	865	186,164
Friesland	2,047	317,405
Overyssel	2,076	267.826
Groningen	1,432	242,065
Drenthe	1.689	113,773
Limburg	1,353	235,135
Total	20.527	3,865,456

Connected with the kingdom, though possessed of a separate administration, is that portion of *Luxemburg* that the king of *H.* possesses with the title of Grand Duke (the other portion belonging to Belgium). The Grand Duchy of Luxemburg has an area of 1,592 sq. m., and a population of 197,528, so that there are 124 inhabitants per sq. m., while in *H.* the density of pop. is 179 per sq. m. By the treaty of London, of May 11, 1867, this Grand Duchy was declared a neutral country, under the protection of the Great European Powers, in case of war.

H. possesses a comparatively larger town population than any other country in Europe. There are 18 towns in the kingdom with a pop. of above 20,000 inhabitants, namely: —

Amsterdam	296,200	Leenwarden	27,085
Rotterdam	136,230	Dordrecht	26,576
The Hague	104,095	Tilburg	26,103
Utrecht	66,106	's Hertogenbosch	24,583
Leyden	41,298	Delft	24,511
Groningen	40,589	Nymegen	23,509
Arnheim	38,017	Helder	22 030
Haarlem	34,797	Schiedam	21,880
Maestricht	29,083	Zwolle	21,593

By a law passed Sep. 17, 1870, capital punishment was abolished in *H.*, and since that period there has been a decrease of crime.

This country is composed of the lowest part of the great plain of Northern Europe, its level being indeed in many places below that of the sea, against which it is protected, partly, as in Zealand, Friesland, and Guelderland, by numerous dikes, and partly, as between the Helder and the Hook of Holland, by sandhills or *dunes* cast up by the ocean upon the shores; though, despite every precaution, it has often greatly suffered from inundations. The whole, saving some slight elevations in Guelderland, Utrecht, and Overyssel, forms one unbroken flat, without a hill or rock, without forests, or, except in the S. part, running waters; the land consisting mainly of moor and marsh, traversed, like network, by numerous canals, which, while they are absolutely necessary to drain it, and render it fit for cultivation, answer, for the most part, the purpose of roads, many of them, indeed, being navigable for large vessels. The astonishing ingenuity, industry, and perseverance by which *H.* is thus protected against inundation, and rendered at once available for cultivation and internal communication, has been amply rewarded, for the country is exceedingly fertile, and is, for its size, one of the richest, most populous, and most powerful in the world. In the northern provinces the principal natural feature is the Zuyder Zee, a shallow inland sea, separating the prov. of North *H.* from Friesland and Overyssel. There are also numerous lakes, the chief being the Haarlem-meer, a wide expanse in the vicinity of that city and Amsterdam. In the southern prov. the leading feature is the Rhine (Waal), and its tributary, the Meuse, which enter the sea by various channels, though chiefly by way of Dort and Rotterdam. Several parts of the kingdom are likewise distinguished by extensive marshes, as the Bourtaug on the N. E. frontier, and the Peel in North Brabant. As means of communication between Amsterdam and the North Sea, the Zuyder Zee has long been unsatisfactory, on account of the Pampus Bank and numerous shallows. Sometimes, in consequence of long-continued northerly and easterly winds, its bed is almost dry, and vessels are everywhere lying on the sands. A substitute was accordingly provided for it in the great North Holland Canal, one of the most stupendous works of the kind in existence. It was begun in 1819, and finished in 1825, at a cost of about $5,000,000. It is about 50 m. in

length. Its breadth, at the surface, is 124½ ft., at the bottom 36. The depth is 20 ft 9 in. Its level is that of the high tides of the sea, from which it receives its supply of water. This canal having been found insufficient for large steamers, it was resolved to make a more direct communication between Amsterdam and the North Sea at Why aan Zee, by draining a portion of the river Y, and cutting a canal through the sand-hills. This was begun in 1865 by the Amsterdam Canal Co., and is at present (1880) in process of completion. The general aspect of *H.* is different from that of any other country in Europe. The roads and canals are usually lined with willows and other trees, which afford an agreeable shade and relieve the uniformity of the landscape. Innumerable villas are seen decorated with the utmost nicety of art. Spires, church-towers, villages admirable for neatness and cleanliness, large and well-built cities, rapidly succeeding one another; meadows in vernal green varied by sheets of water, cattle in large herds, barges towed by horses or spreading a sail to catch a favoring breeze, — everything and every place in the highest order and perfection, — such are the sights which *H.* supplies in abundance, and in respect of which it has no parallel in any other part of the world.

Climate. In respect of climate, *H.* labors under many disadvantages. In winter it is much colder than England, and the waters are frequently frozen for three months. Even the Zuyder Zee is sometimes frozen over. The temperature has been sometimes as low as 23° below zero of F., and sometimes as high as 102° In summer, cold nights often succeed to days of intense heat. The climate generally is variable. The atmosphere, especially in the western prov., is loaded with moisture, and there agues, dropsies, pleurisies, and rheumatisms are frequent. Guelderland is the healthiest prov., but all the eastern side of the country is comparatively salubrious. *H.* is frequently subject to violent gales of wind, which, when they blow from the W. or N. W., are apt to cause inundations of the sea.

Agriculture. This remarkable country largely rewards the skill and labor of the agriculturist. The south and central prov. are the most fertile. The farms in the best parts of Zealand vary in extent from 166 to 330 acres each. In South *H.* the proportion of pasture to arable land is about 2 to 1 In Friesland the quantity of pasture is more than 8 times that of arable land. In Guelderland there are large plantations of apple, pear, and cherry trees. Tulips and hyacinths are extensively cultivated in the neighborhood of Haarlem in fields of several acres each. Pulse and garden vegetables are everywhere raised in great abundance, also woad and madder. Flax is largely cultivated in the S., and especially in the neighborhood of Dort. Utrecht and Guelderland produce considerable quantities of tobacco. The rearing of live-stock, however, and dairy husbandry, are much more important sources of national wealth than tillage. The lean cattle brought from Denmark and Germany fatten with great rapidity in the Dutch *polders*. Large herds of beautiful cows yield great abundance of the richest milk Butter and cheese of the best quality are largely exported, and bring great wealth to the peasantry. The Dutch horses are good, and well adapted for draught; the best are those of Friesland. The breeds of sheep, however, are not particularly good. In North and South *H.*, Groningen, and Utrecht there are made 140,000,000 lbs. of cheese annually, the home consumption of which does not exceed one twentieth. This large quantity at its average price produces $9,000,000 annually. The value of the butter is about $10,000,000 more, of which their own consumption amounts to one tenth.

In 1879 the acreage of productive lands was as follows: wheat, 214,837; rye, 487,803; barley, 112,512; oats, 257,410; buckwheat, 163,829; pease, beans, etc., 136,303; potatoes, 329,917; hemp, 2,765; flax, 54,053; colza, 42,676; poppy, etc., 7,785; sugar beet, 36,152; hops, 521; tobacco, 3,904; madder, chicory, etc., 12,788. In the same year there were in farm-animals: horses, 253,393 cattle (including cows), 1,469,937; sheep, 898,715; hogs, 611,004; goats, 146,169.

The fisheries, once a principal source of wealth, have greatly declined

Commerce and Manufactures. The principal manuf. are those of woollens in Leyden and Utrecht; silks in Utrecht, Haarlem, and Amsterdam, tobacco pipes at Gouda; and paper, tobacco, leather, sugar-refining, painters' colors, and cordage in various places. The distilling of geneva (see HOLLANDS) is prosecuted extensively at Schiedam, and ship-building at Rotterdam and Amsterdam. Commerce, however, has always been pre-eminently the national pursuit of the Dutch The greatness of the trade of *H.* during the 17th century, and its decline in the 18th, belong to history. For a lengthened period the Dutch engrossed nearly the whole sea-fishery of Europe, and they were long the carriers and factors of the principal European States *H.* was still, at her emancipation from the French yoke, in 1814, the richest country in Europe. Its trade has since revived in a very remarkable manner, and has benefited greatly from the improved administration of its important colonies; so that its commercial prosperity nearly equals now that which the Netherlands obtained in its palmiest days, when Beaves said of it, in his *Lex Mercatoria:* "It produces hardly anything, and yet has wherewith to furnish other people all they can have need of. It is without forests, and almost without wood. There are no mines or metals, and yet there is found as much gold or silver as in New Spain or Peru, as much iron as in France, as much tin as in England, and as much copper as in Sweden. The wheat and other grains that are there sowed hardly suffice for nourishment to a part of the inhabitants; and it is, notwithstanding, from hence that the greatest part of its neighbors receive them, either for their subsistence or trade. In fine, it seems as if the spices grew there, that the oils were gathered there, that it nourished the precious insects which spin the silk, and that all sorts of drugs, for medicine or dyeing, were in the number of its products and of its growth. Its warehouses are so full, and its merchants seem to carry so much to strangers, or that strangers come to load in its ports, that there is not a day, and it may be said a moment, that ships do not come in or go out, and frequently entire fleets." Such was the picture drawn of *H.* in 1670 Its present commercial condition, though different in every other respect from the Netherlands of that period, is quite as prosperous, and rests upon a basis more solid and secure.

The foreign commerce of *H.*, classified like that of Belgium and France, into "general and special," is chiefly carried on with two countries, Germany and Great Britain, the former standing first in the list as export, and the latter first as import market. No returns are kept of the value of the general commerce, but only of the weight of the goods. For the year 1878, the value of exports of home produce was 578,876,590 gulden ($228,676,871); and the value of imports for home consumption was 791,684,422 gulden ($304,798,502). The imports principally consist of corn, sugar, coffee, spices, tobacco, cotton, tea, indigo, cochineal, wine and brandy, wool, grain of all sorts, timber, pitch and tar, hemp and flax, iron, hides, linen, cotton and woollen stuffs, hardware, rock salt, tin plates, coal, dried fish, bacon and hams, lard, mineral oil, etc. The exports consist partly of the produce of *H.*, partly and principally of the produce of her possessions in the East and West Indies and other tropical countries, and partly of commodities brought to Amsterdam, as to a convenient entrepôt from different parts of Europe. Of the first class are cheese and butter, madder, clover, rape, hemp, and linseeds, rape and linseed oils, Dutch linen, etc. Geneva is principally exported from Schiedam and Rotterdam; oak bark and cattle principally from the latter. Of the second class are spices, coffee, and sugar, principally from Java, but partly also from Surinam, Brazil, and Cuba; indigo, cochineal, cotton, tea, tobacco, and all sorts of Eastern and colonial products. And of the third class, all kinds of grain, linens from Germany, timber and all sorts of Baltic produce; Spanish, German, and English wools; French, Rhenish, and Hungarian wines, brandy, etc

Table exhibiting the Value of the Commerce of Holland with the U. States for the 20 years, from 1859 to 1878.

Year.	Imports from the U. States.		Exports to the U. States.	Total Imports and Exports.
	Domestic.	Foreign.		
	$	$	$	$
1859.	4,497,241	209,742	4,397,232	9,104,215
1860.	3,762,413	209,918	2,869,959	6,842,290
1861.	3,254,141	465,232	2,811,334	6,530,707
1862........	2,440,232	284,876	1,662,454	4,387,562
1863........	3,358,221	279,354	1,546,514	5,184,089
1864........	3,433,523	103,964	1,324,637	4,862,124
1865	3,006,453	128,421	778,020	3,912,894
1866	2,407,149	23,282	2,778,314	5,208,745
1867	2,966,502	113,205	1,585,360	4,665,067
1868........	4,624,454	31,477	1,273,857	5,929,788
1869........	3,936,163	89,593	2,691,323	6,717,079
1870.	6,115,821	284,014	1,344,922	7,744,757
1871.	12,381,161	288,970	2,047,962	14,718,093
1872.	11,010,391	165,541	2,547,715	13,723,647
1873.	10,842,840	367,468	2,943,077	14,153,385
1874	13,712,846	202,578	2,516,623	16,432,047
1875	7,483,010	60,064	2,353,658	9,896,732
1876	12,185,355	57,753	2,438,257	14,681,365
1877	10 411,757	156,578	2,547 119	13,115,454
1878........	13,174,079	125,968	2,774,934	16,074,981
Total.....	135,003,752	8,647,998	45,233,271	183,885,021

The value of the principal articles imported from and exported to the U. States during the year 1878 was as follows: *Imports:* Agricultural implements, $20,579; breadstuffs (chiefly wheat and rye), $3,145,880; carriages, $11,612; cotton, raw (58,703 bales), $3,032,189; cotton goods, $19,216; drugs, etc., $36,088; fruits (dried apples), $52,089, (preserved in cans) $1,721; iron (machinery, etc.), $59,009; leather (and manuf of), $180,320; naval stores, $193,312; mineral oil, $2 189,848; lard oil, $17,591; bacon and hams, $409,996; salted beef, $56,056; lard, $612,674. preserved meat, $41,053;

seeds, $118,311; spirits of turpentine, $69,780; starch, $138,927; tallow, $736,681; tobacco (leaf), $1,364,803, (manuf. of) $112,496; wood (timber), $258 471; wooden ware, etc., $19,541. — *Exports:* Argols, $36,349; chemicals, dyes, etc., $448,899; coffee, $32,712; gums, $15,075; hides and skins, $54,905; madder, $31,016; rags, $11,690; seeds, $32,674; books, etc., $12,138; chemicals, drugs, etc., $95,314; cotton goods, $29,226; fancy goods, $31,050; pickled herring, $137,687; flax (raw), $18,272; fruits and nuts, $82,682; iron (pig), $106,035; steel ingots, $10,699; paints, $87,035; provisions, $52,526; silk goods, $390,046; spices, $73,915; spirits and cordials, $145,977; wines, $216,598; wood (cabinet ware), $31,191; wool (cloth), $44,359, (dress goods) $31,512.

The above statement does not include the commerce of the U. States with the Dutch East and West Indies, which is given separately under the names of each of these colonies.

Shipping. The following table shows the number and tonnage of the vessels belonging to the mercantile navy in 1878: —

Description of Vessels.	Number.	Tons.
Ships (Fregatten)	179	152,497
Barks (Barken)	206	119,509
Brigs (Brikken)	79	22,997
Schooner-brigs (Schoener-Brikken)	170	27,010
Schooners (Schoeners)	310	50,915
Galliots (Galjooten)	203	23,265
Koff boats (Koffen)	275	32,272
Flogs (Fjalken)	221	14,044
Smacks (Smakken)	8	627
All other vessels (andere Zeilschepen)	158	6,561
Steamboats (Stoomschepen)	86	76,827
Total	1,835	526,527

During the year 1878, 196 Dutch sailing vessels and 29 steamers (aggregate tonnage, 229,592) entered, and 296 sailing vessels and 34 steamers (aggregate tonnage, 296,313) cleared, the ports of the U. States. For the same year 18 American sailing vessels (tonnage, 13,546) entered, and 22 sailing vessels (tonnage, 12,690) cleared, the ports of the kingdom of *H.*

Finances. The national revenue, derived mainly from excise duties, chief among them those on spirits, from direct taxes on land and assessed, and from stamps, amounted for the year 1878 to 142,474,363 guilders, or $54,852,629; and the expenditures, from which the interest upon the public debt forms the principal branch, to 118,199,296 guilders, or $45,506,928. These figures do not include the revenue and expenditure of the East India possessions, which are given under JAVA. The following table gives the division of the national debt of the kingdom of *H.*, with the annual interest: —

Funded Debt.	Nominal Capital.	Annual Interest.
	Guilders.	Guilders
2½ per cent debt	632,099,402	15,802,485
3 per cent "	91,322,950	2,739,688
3½ per cent redeemable debt		
April 1, 11,400.000 guilders; October 1, 11,100,000 "	11,250,000	391,125
4 per cent debt	219,899,500	8,795,980
Total	954,571,852 $367,510,163	27,729,278 $10,695,772

Banking, Credit, Discount, etc. The celebrated Bank of Amsterdam was founded in 1609, on strictly commercial principles and views, and not to afford any assistance, or to intermeddle with the finances of the state. Amsterdam was then the great entrepôt of the commerce of the world, and of course the coins of all Europe passed current in it. Many of them, however, were so worn and defaced as to reduce their general average value to about 9 per cent less than their mint value; and, in consequence, the new coins were immediately melted down and exported. The currency of the city was thus exposed to great fluctuations; and it was chiefly to remedy this inconvenience and to fix the value or par of the current money of the country, that the merchants of Amsterdam established a "bank," on the model of that of Venice. Its first capital was formed of Spanish ducats or ducatoons, a silver coin which Spain had struck in the war with Holland, and with which the tide of commerce had enriched the country it was formed to overthrow. The bank afterwards accepted the coins of all countries, worn or new, at their intrinsic value, and made its own bank-money payable in standard coin of the country, of full weight, deducting a "brassage" for the expense of coinage, and giving a credit on its books, or "bank-money," for the deposits. The Bank of Amsterdam professed not to lend out any part of the specie intrusted to its keeping, but to retain in its coffers all that was inscribed on its books. In 1672, when Louis XIV. penetrated to Utrecht, almost every one who had an account with the bank demanded his deposit, and these were paid off so readily that no suspicion could exist as to the fidelity of the administration. Many of the coins then brought forth bore marks of the conflagration which happened at the Hôtel de Ville soon after the establishment of the bank. This good faith was maintained till about the middle of the last century, when the managers secretly lent part of their bullion to the East India Company and Government. The usual "oaths of office" were taken by a religious magistracy, or rather by the magistracy of a religious community, that all was safe; and the good people of *H.* believed, as an article of their creed, that every florin which circulated as bank-money had its metallic constituent in the treasury of the bank, sealed up and secured by oaths, honesty, and good policy. This blind confidence was dissipated in December, 1790, by a declaration that the bank would retain 10 per cent of all deposits, and would return none of a less amount than 2,500 florins. Even this was submitted to and forgiven. But four years afterwards, on the invasion of the French, the bank was obliged to declare that it had advanced to the states of *H.* and West Friesland, and the East India Company, more than 10,500,000 florins, which sum it was, of course, unable to make up to the depositors, to whom, however, it assigned its claims on the states and the company. Bank-money, which previously bore an agio of 5 per cent, immediately fell to 16 per cent below current money. This epoch marked the fall of an institution which had long enjoyed an unlimited credit and had rendered the greatest services.

The actual *Bank of H.* was founded at Amsterdam in 1814. It is not, like the old Bank of Amsterdam, merely a bank of deposit, but a bank of deposit and circulation, formed on the model of the Bank of England. Its capital, which originally amounted to 5,000,000 florins, was doubled in 1819. It has the exclusive privilege of issuing notes. Its charter was prolonged in 1863 for a period of 25 years.

The *credit* allowed at Dutch ports on most articles is 3 months; some articles, however, are always sold for ready money; a discount is generally given in prompt payments; but the terms of credit on most articles and the discount allowed for ready money have been fixed by usage, and are regarded as essential conditions in every bargain. Some of the more important of these terms and discounts are specified in the following table. In consequence of the preference given in *H.* to ready-money transactions, it is not a country in which adventurers without capital have much chance of speedily making a fortune; and it should be mentioned to the honor of the Dutch, and as a proof of the excellence of their ready-money system, that, notwithstanding the distress and loss of trade occasioned by the invasion and occupation of their country by the French, the bankruptcies in 1795 and subsequent years were not, comparatively, so numerous as in England in ordinary seasons. The regulations in the Code Napoléon as to bankruptcy are enforced in *H.*

It has long been the practice in *H.* to make, on selling articles, considerable deductions from their weight, particularly from those of large bulk, as compared with their value. These tares and drafts, as they are termed, are now fixed by ancient usage, and the most important amongst them are here specified.

Tares and Allowances on the Principal Articles sold at Amsterdam.

Articles.	Tares and Allowances	Discount
Coffee	3 per cent	cash 1 per cent; Neth Trading Co., 1½ per cent.
Rice: in bales	3 kilos. per bale, 1½ per cent, and 2 per cent.	2 per cent and 1 per cent for cash.
casks	2½ kilos. per cask, and 13 per cent.	ditto.
half-casks	2½ kilos. per ½ cask, and 14 per cent.	ditto
Tobacco: Maryland	net weight, 1 per cent, 2 per cent., 3 per cent, and 8 per cent.	1 per cent and 1 per cent for cash.
Virginia	3 per cent	ditto.
Kentucky	ditto	ditto.
Java	2 kilos. per bale	1 per cent for cash.
other kinds.	according to agreement.	
Butter: Friesland	7 kilos. per firkin	none.
N & S. Holland	8 kilos. per firkin, and 4½ kilos. per half-firkin.	none.
Cheese: Gouda and Leyden	1 per cent	1 per cent for cash.
Edam	2 per cent	ditto.
Cocoa	3 per cent	ditto.

Tares and Allowances. — Continued.

Articles.	Tares and Allowances.	Discount.
Indigo	1 per cent and 2 per cent	1 per cent for cash.
Cochineal	real tare	2 per cent and 1½ per cent for cash
Fustic	12 kilos per mille, 2 per cent and 3 per cent	2 per cent and 1 per cent for cash.
Logwood	ditto	ditto
Gums	real tare, 1 per cent and 2 per cent	ditto.
Madder	real tare, and 5 kilos per cask. Casks are charged in account at about 5*s*. each.	ditto.
Raw sugar: casks	15 per cent	1½ per cent for cash.
cases	18 per cent	ditto
mats	8 per cent	ditto.
bags	ditto	ditto.
baskets	1 per cent and 12 per cent.	1 per cent and 1½ per cent for cash.
Molasses	1 per cent, 2 per cent, and 18 per cent.	2 per cent and 1 per cent for cash
Tin plates	—	1 per cent for cash
Herrings	—	ditto
Cotton: Surat, Bengal, American, and Surinam	6 per cent.	ditto.
Japan and Chinese	net weight	ditto.
Gin	—	cash.
Flax	—	ditto.
Hemp	2 per cent	1 per cent and 1 per cent for cash
Licorice	net tare, 1 kilo for rope, and 1 per cent.	2 per cent. 1 per cent, and 1 per cent for cash
Pepper	5 kilos. per bale	2 per cent for cash
Cinnamon	1½ kilos per bale, and 1 per cent	1½ per cent for cash
Cloves, mace, pimento, and nutmegs	net weight	ditto
Ginger	9½ kilos per case	1 per cent for cash.
Saltpetre	net weight and 1 per cent	2 per cent, 1 per cent, and 1 per cent for cash
Wool: Cape	3 per cent.	1 per cent.
Buenos Ayres	6 kilos per bale	ditto
Kurrachee	4½ per cent	ditto

The above are the customary tares and other allowances made by the merchants in their transactions with each other. But in paying the import duties at the custom-house, the tare upon goods paying duty by weight is, with the exception undermentioned, fixed at 15 per cent for such as are in casks or cases made of wood, and at 8 per cent for such as are in packages, canisters, mats, baskets, leather, linen, etc.

Railroads. On the first of January, 1879, there were railroads of a total length of 1,668 kilometres, or 1,040 miles, open for traffic in the kingdom. The State owned 815 kilometres, or 509 miles, and private companies 853 kilometres, or 531 miles. The following table gives total length of railroads opened for traffic at that time: —

Railroads.	Length.
Private Companies: —	Kilomètres
Dutch-Rhenish	210
Rotterdam-Antwerp	118
Maestricht-Aachen	37
Amsterdam-Rotterdam	102
Utrecht-Kampen	101
Maestricht-Lüttich	29
Almelo-Salzbergen	65
Eindhoven-Hasselt	57
Tilburg-Turnhout	31
Nymegen-Kleef	27
Neuzen-Gent and Mechelen	86
Total, private companies	853
State railroads	815
Total	1,668
In miles	1,042

Colonies. The following table gives the area and population of the various colonial possessions, divided into three groups; first, the possessions in Asia or the East Indies, secondly, the West India islands; and thirdly, the colony of Surinam, in South America: —

Colonial Possessions.	Area: English Square Miles.	Population.
1. East Indies: —		
Java and Madura	51 324	18,125,269
Sumatra, West Coast	46,200	961,187
Benkulen	9,576	135,482
Lampongs	9,975	117,370
Palembang	61,152	508,668
Riau	17,325	61,000
Banca	4,977	64,257
Billiton	2,500	27,297
Borneo, West Coast	58,926	365,630
Borneo, S. and E. Districts	137,928	898,875
Celebes	45,150	360,627
Menado	26,600	217,377
Molucca Islands	42,420	198,011
Timor and Sumba	21,840	900,000
Bali and Lombok	3,990	69,148
New Guinea	67,410	200,000
Total, East Indies	607,293	24,276,638
2. West India Islands: —		
Curaçao	160	23,972
Aruba	69	5,670
St Martin	13	3,101
Bonaire	95	4,470
St. Eustache	12	1,809
Saba	7	2,002
Total, West Indies	356	41,024
3 Surinam	59,051	69,329
Total Possessions	666,700	24,386,991

The population of the West India islands is after a census taken at the end of 1874, and that of the other colonial possessions — with the exception of Timor and Sumba, Bali and Lombok, and New Guinea, which are only estimates — after enumerations of 1872-1875.

Of the Dutch colonial possessions the East India island of Java, with the adjoining Madura, is by far the most important. Administered as dependencies of Java are the whole of the possessions of *H.* in the East Indies. The kingdom derives a considerable revenue from its colonial possessions, arising from the sale of colonial produce, chiefly coffee and tin. The sales are effected on what is called the Consignation system, carried out through the medium of the Netherlands Trading Company, acting as agents of the government (see JAVA).

Money. The *Guilder*, *Gulden*, or *florin* = $0.385 value of exchange in the United States. — The money in general circulation is chiefly silver: but a bill which passed the States-General in the session of 1875 ordered an unrestricted coinage of ten-guilder pieces in gold.

Weights and Measures. H. adopted the French metric system of weights and measures in 1820, retaining, however, old designations for the same. Much confusion having arisen therefrom, an act was passed April 7, 1869, establishing from January 1, 1870, a series of new international names of weights and measures, with facultative use, during the first ten years, of the old denominations The principal new names, together with the old designations, are: —

The *Kilogram* (Pond) = 2 205 lbs avoirdupois.
" *Meter* (El) = 3.281 feet.
" *Kilometer* (Myl) = 1093 yards, or nearly 5 furlongs.
" *Are* (Vierkante Roede) = 119 6 sq. yards, or 0 246 sq. acre.
" *Hektare* (Bunder) = 2.47 acres.
" *Stere* (Wisse) = 35.31 cubic feet.
" *Liter* (Kan) = 1.76 pints.
" *Hektoliter* (Vat) = 22 gallons.

All the other French metric denominations are adopted with trifling changes in the new code of names.

Seaports. The chief ports of *H.* are Amsterdam, Delfzyl on the Ems, Dordrecht on the Waal, Middleburg and Flushing in the island of Walcheren, Harlingen, at the mouth of the canal of Leewarden, in Friesland, and Rotterdam. Of these, the three following are the most important: —

Amsterdam, the principal city of *H.*, sometimes called the "Venice of the North," is situated in lat 52° 22′ N, lon 4° 53′ E, at the confluence of the Amstel with the Y, an arm of the Zuyder Zee Within the city four canals — the Prinsen Gracht, Keizer's Gracht, Heeren Gracht, and the Singel — extend, in the form of polygonal crescents, nearly parallel to each other; while numerous smaller canals intersect the city in every direction, dividing it into about 90 islands, with nearly 290 bridges. Some of these are of stone, but the majority are of iron and

wood, and so constructed as to allow vessels for inland navigation to pass through. Westward of the river Amstel, which passes almost through the centre of the city, is the more modern part, where the houses are often exceedingly handsome, and the streets broad, and planted with rows of large trees between the houses and the canals. The harbor is capacious and secure, admitting the largest vessels close to the quays and docks. At the mouth of the Y there is a bar called the Pampus, to cross which large vessels must be lightened; but this inconvenience, as well as the delays and dangers attending the navigation of the Zuyder Zee, has been obviated by the ship-canal mentioned in page 540 Amsterdam has sugar refineries; soap, oil, glass, iron, dye, and chemical works; distilleries, breweries, tanneries: tobacco and snuff factories. The cutting of diamonds has long been practised in the city by the Jews. Amsterdam is, however, more distinguished by its trade, which, though now somewhat reduced, is still very considerable. A great portion of the trade between Great Britain and *H.* is carried on with Rotterdam, which is much more conveniently situated for such intercourse than Amsterdam. But the latter continues to engross by far the larger share of the commerce with the flourishing colony of Java, the other Dutch possessions in the East, and with the U. States; and is, consequently, the principal mart on the continent of Europe for Eastern and American produce. The Amsterdam merchants were formerly the most extensive dealers in bills of exchange, and though London is now in this respect far superior to Amsterdam, the latter still enjoys a respectable share of this business.—*Custom-house Regulations.* Captains of ships are bound to make, within 24 hours of their arrival at Amsterdam, or any Dutch port, a declaration in writing of the goods of which their cargo consists. If the captains be not acquainted with the goods of which the cargo consists, they must make their declaration under the general term of *merchandise*, and exhibit the bills of lading along with the declaration. The custom-house officers are instructed to inform the captains of almost all formalities required by law.—The *warehousing system* has been long established in Amsterdam; and all goods, whether for home consumption or transit, may be deposited in bonded warehouses. Speaking generally, goods can only be kept in bonded warehouses for two years; but grain of all kinds may be kept for an unlimited period. The warehouse rent chargeable per month on a quarter of wheat is, on an upper loft, $2\frac{6}{10}$ cents; on an under loft, 3 cents. On a ton (Eng.) of sugar in casks the charge is 16 cents; in bags, 12 cents The dock and its adjacent warehouses belonging to the *Entrepôt Général*, or establishment for warehousing goods imported by sea or intended to be re-exported by sea or by the Rhine, are large and commodious. The dock has water to float the largest ships, and the dues and other charges are exceedingly moderate Merchants may employ their own men or those of the dock in loading or unloading; and may either place their property in separate vaults or floors of which they keep the key, or intrust it to the care of the dock officers.

Flushing [Dutch, *Vlissingen*], a fortified seaport town of the province of Zealand, is situated on the island of Walcheren, at the mouth of the estuary of the Western Scheldt, about 50 m. S. W. of Rotterdam. Since 1872 it has had railroad connection with the main lines of Europe; and by the construction in 1873 of a great harbor, docks, and canal works, a communication between it and the North Sea has been opened up for vessels of the largest size The outer harbor has a surface of 33.11 acres, and a depth at low water of 22 feet; the depth of both the inner harbors at low water is 27 feet, the surface of the one being 16.55 acres and that of the other 11.86 acres. With these works Flushing possesses one of the finest and safest harbors of Europe, and the one of the Dutch coast best adapted for the trade with Germany. Pop. 12,000.

Rotterdam, a seaport on the N. bank of the Maas, and the second commercial city of *H.*, is situated in lat. 51° 55′ 19″ N, lon 4° 29′ 14″ E. It is more advantageously situated than Amsterdam, being nearer the sea; and the canals which intersect it are so deep as to admit of the larger vessels coming up to the quays and warehouses of the merchants Its commerce is yearly increasing, and it is the best market for madder and geneva. It has a regular and frequent intercourse by steamers with London, Liverpool, Hâvre, Hamburg, etc.

Holland, a kind of linen which, when brown or unbleached, is used chiefly for window-blinds and children's garments; bleached is used for finer purposes.

Hollands, Geneva, Schiedam, Hollands Gin, Dutch Gin, a superior kind of gin made in Holland.

The materials employed in the distilleries of Schiedam, in the preparation of this excellent spirit, are 2 parts of the best unmalted rye and 1 part of malted bigg, reduced to the state of coarse meal by grinding. About a barrel (36 galls.) of water, at a temperature of from 162° to 168° F., is put into the mash-tun for every $1\frac{1}{2}$ cwt. of meal, after which the malt is introduced and stirred, and, lastly, the rye is added. Powerful agitation is next given to the magma till it becomes quite uniform, when the mash-tun is covered over with canvas, and left in this state for two hours. Agitation is then again had recourse to, and the transparent "spent wash" of a preceding mashing is added, followed by as much cold water as will reduce the temperature of the whole to about 85° F. The gravity of the wort at this point varies from 33 to 38 lbs. A quantity of the best pressed Flanders yeast, equal to 1 lb. for every 100 galls of the mashed materials, is next stirred in, and the whole is fermented in the mash-tun for about 3 days, or until the attenuation is from 7 to 4 lbs. (sp. gr 1 007 to 1 004). During this time the yeast is occasionally skimmed off the fermenting wort. The wash, with the grains, is then transferred to the still, and converted into "low wines" To every 100 galls of this liquor 2 lbs. of juniper berries (3 to 5 years old), and about 1 lb. of salt, are added, and the whole is put into the low-wine still, and the fine spirit drawn off by a gentle heat, one receiver only being employed. The product per quarter varies from 18 to 21 galls of spirit, 2 to 3 o. p.—2 (*Best Hollands.*) Hollands rectified to the strength of 24° Baume (sp. gr. .9125, or about 6 o. p.).—3 (*English-made.*) From juniper berries (at least a year old, and crushed in the hands), 3 lbs.: rectified spirit, $1\frac{1}{2}$ gall. (or proof spirit, $2\frac{1}{2}$ galls); digest, with agitation, for a week, and then express the liquor: after 24 hours' repose, decant the clear portion, add it to good corn spirit, at 2 or 3 % overproof, 90 or 100 galls., and mix them well together The last form, which is only given as example, produces a very pleasant spirit if it is kept for some time to "mellow." Age is one of the principal causes of the "creaminess" of Dutch gin, which usually lies in bond for some time before being consumed. The product is, however, much superior if the ingredients are rectified along with 20 galls of water, and about 14 lbs. of salt, by a gentle heat. It will be seen from the above that the superior flavor of Hollands spirit depends more on the peculiar mode of its manufacture than on the quantity of juniper berries employed; 2 lbs of them, when new, being barely equivalent to 1 oz. of the essential oil; and when old, to less than $\frac{1}{2}$ oz., a quantity wholly insufficient to flavor 100 galls. of spirit. The Dutch distillers most noted for this liquor add a little pure Strasburg turpentine and a handful or two of hops to the spirit, along with the juniper berries, before rectification. The former substance has a pale yellowish-brown color, and a very fragrant and agreeable smell, and tends materially to impart that fine aroma for which the best geneva is distinguished. At Rotterdam sweet-fennel seed is commonly added as a flavoring; and at Weesoppe Strasburg turpentine and fennel seeds, or the essential oil of fennel, are frequently substituted for a large portion of the juniper berries Schiedam Hollands is considered the best: the next quality is that of Rotterdam; after these comes that of Weesoppe. *Imp.* duty same as alcohol. See GIN.

Hollow, that contains an empty space; cavernous; concave; sunken; empty; void; evacuated in the interior.

Hollow Girder, an iron girder not solid.

Hollowing-Knife, a drawing-knife, used by coopers for working on concave surfaces.

Hollowing-Plane, a carpenter's plane, having a round, convex sole.

Hollow Rail, a tubular railroad rail which has been steam-heated to prevent the accretion of snow and ice.

Hollow-Ware, a general trade-name given to various kinds of culinary and other vessels made of iron. Some are made of wrought-iron by stamping; some by riveting pieces together; some by casting in moulds. These vessels may be left in the plain metallic state, or may be blackened on the outside by a kind of japan. The interior in cheap ware is left untouched, but the better kinds are either coated with tin, nearly in the same way as tin plate, or with enamel (see ENAMEL). *Imp.* duty: glazed or tinned, $3\frac{1}{2}$ cts. per lb.

Holly, a small tree or shrub of the genus *Ilex*. The wood of the European *H.* (*Ilex aquifolium*, Fig. 271) is almost of an ivory whiteness, except near the centre of very old trunks, when it is of a brownish hue. It is very hard and compact, with a fine grain, and susceptible of a high degree of polish, which renders it well adapted for many purposes in the arts. When dry, it weighs $47\frac{1}{2}$ lbs. to a cubic foot, and is very retentive of its sap, in consequence of which it is liable to warp, unless it is well dried and seasoned before being used. It readily takes a durable color of almost any shade, and hence it is much

used by cabinet-makers in forming what are technically called "strings and borders" in ornamental works. When properly stained black, its color and lustre are little inferior to those of ebony. It may be applied to a great number of purposes by joiners, cabinet-makers, turners, engineers, mathematical instrument makers, and next to the box and pear-tree it is the best wood for engraving upon, as it is compact, and stands the tool well. Among its principal uses in Europe at present is, when dyed black, to be substituted for ebony, in the handles of metallic teapots, etc. In France the young shoots and the branches are given to sheep and deer during winter; and the stronger straight shoots, deprived of their bark, are made into whip-handles and walking-canes. The bark of the *H.* contains an abundance of viscid matter; and when macerated in water, fermented, and then separated from the fibres, it forms bird-lime. Medicinally, the bark of this tree is mucilaginous, emollient, and solvent, and is said to possess strong febrifugal powers. The berries are purgative, and 6 or 8 of them, when swallowed, will cause violent vomiting; though they are considered as poisonous to men, they form the food of some birds, more especially of the thrushes. — The wood of the American *H.* (*Ilex opaca*) resembles that of the European species, except that it is rather browner at the heart. It is compact, heavy, of a fine grain, and is susceptible of a brilliant polish. Its principal use is for inlaying mahogany furniture, and for turning into small boxes for druggists, and for small screws. When perfectly seasoned, it is very hard and unyielding, which renders it well adapted for pulleys used in ships. It may be dyed of various colors, so as to resemble many foreign woods. The bark may be employed for making bird-lime, in a similar manner as that of the preceding species. Medicinally, it is emetic and cathartic.

Fig. 271. — Holly.

Hollyhock, a tall-stemmed plant (*Althea rosea*) with a gaudy flower, cultivated in gardens; the flowers are mucilaginous and demulcent, and the leaves dye blues.

Holometer, a mathematical instrument for taking measures both on the earth and in the heavens.

Holstein cattle. See CATTLE (NEAT).

Holster, a leather case for pistols fixed at the saddle of a horseman.

Holy-Stone, a large stone, used with sand, for scouring a ship's decks by hand. It receives its name from the unwillingness of sailors to submit to the drudgery of using it.

Holy-water Pot, an ornamental vase, used to keep holy water in churches, etc.; a benitier.

Homard [Fr.], a lobster.

Home, in naval language, is said of anything that is close in its place; it is applied to the sheets of the sails, the shot and cartridge in a gun, and any article of stowage.

Home, a fire-insurance Co., located in New York City, organized in 1853. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, \$3,000,000; net surplus, \$1,363,488.94; risks in force, \$344,131,435; premiums, \$3,464,353; premiums received since the organization of the Co., \$45,887,470.88; losses paid, \$28,487,370.23; cash dividends paid to stockholders, \$4,615,000.

Home, a fire-insurance Co., located in Newark, N. J., organized in 1873. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, \$200,000; net surplus, \$9,858.58; risks in force, \$5,573,784; premiums, \$56,179.17; premiums received since the organization of the Co., \$299,070.62; losses paid, \$121,621.66; cash dividends paid to stockholders, \$62,000.

Home-Brewed, beer made at a private house; not purchased from a brewery.

Homespun, spun or wrought at home; of domestic make or manufacture.

Homestead, a farm with the land immediately adjoining.

Home-Trade, ships: in the English official returns these comprise ships trading on the coasts of Great Britain and Ireland, or to the continental ports between the limits of the River Elbe and Brest.

Homeward-Bound, on the way home.

Hominy, Indian corn coarsely ground or broken. The cuticle and germ of the shelled corn are removed by the grating or beating action of a machine (*H.*-mill), which also breaks as small as may be wanted. The sizes are graded by sifting.

Homœopathic Medicines, infinitesimal medicines, prepared and used upon the great principle of *homœopathy*, viz., *Similia similibus curantur*, to which *allopathy* is antagonistic.

Honduras, a republic of Central America, lying between Lat. 13° 10′ and 16° N.; lon. 83° 11′ and 89° 30′ W.; and bounded N. and E. by the Bay of *H.* and the Caribbean Sea, S. by Nicaragua, and N. W. by Guatemala; area, 58,168 sq. m. The republic is divided into 13 departments, with a total population of 400,000. Both area and population are only known through estimates, no enumeration having as yet taken place. The bulk of the inhabitants consists of aboriginal Indians, and the sparse European-descended population, mainly of Spanish origin, is in the small ports of the Pacific coast, and in the town of Santa Rosas, in the tobacco districts of Gracias. The capital is Tegucigalpa, with 12 inhabitants. *H.* is governed under a charter proclaimed in November, 1865. There is a chamber of deputies of 37 members, but no senate, in lieu of which latter ten counsellors are appointed by the government to act as advisers, and convened at the president's pleasure. The judicial authority is vested in two chief justices, one of whom resides in the present capital,

and the other in the former capital, Comayagua. The president is elected for four years.

The ports of *H.* on the Atlantic side are Truxillo, Omoa, and Puerto Cortez. On the Pacific, in the Bay of Fonseca, the republic has ten ports, San Lorenzo and the free port of Amapala, on the island of Tigre, which has a fine anchorage and salubrious climate. The republic has a coast-line of 400 m. on the Bay of *H.* and the Caribbean Sea, and 60 m. on the Bay of Fonseca, on the Pacific side. The rivers are numerous, and some of them of large size The Chamelicon, Ulua, Aguan or Roman, Tinto, Patuca, and Segovia, falling into the Atlantic, and the Choluteca, Macaome, and Guascoran, falling into the Bay of Fonseca, are the principal In physical character, climate, and production, *H.* resembles Guatemala. See GUATEMALA.

For a long time the finances of *H.* have been in a great disorder owing to prolonged civil strife, aggravated in 1872 by wars with Guatemala and San Salvador, which continued with short interruption till the end of June, 1876, when exhaustion on all sides brought about a peace. The national foreign debt, amounting to $29,950,540 at the beginning of 1877, consisted of 3 loans: the first, contracted at the London Stock Exchange in 1867, of $5,000,000; the second, issued in London and Paris in 1868, for the nominal amount of $12,450,540, and the third, negotiated in London in 1870, for the nominal amount of $12,500,000. The first and third loans were at 10 per cent, and issued at the price of 80, and the second loan was at 6 per cent, and issued at 75. All the loans were raised for the professed object of constructing an inter-oceanic railroad from Puerto Cortez, on the Pacific, to the Bay of Fonseca, 232 m. in length. The interest in arrear on the three loans amounted to $6,150,820 in 1876 *H.*, however, seems to have entered on the career of civilization in the highest sense of the term under the administration of Don Marco Aurelio Soto, who was elected president, May 29, 1877. It is reported that a satisfactory arrangement has been made with England in regard to the national debt; and the national revenue, which never exceeded $375,000 under former administrations, is said to have reached $800,000 in 1878. The inter-oceanic railroad is now in operation from Puerto Cortez to San Pedro Sula, a distance of about 90 m. The value of the rolling-stock is estimated at $500,000, and the entire cost of the road is given at $2,000,000. There were 750 m. of telegraph at the beginning of 1879, and 500 m. additional were in process of construction. A contract for a line of bi-weekly steamers to Cuba was signed in 1878, and extensive concessions of land have been made to North America for the cultivation of coffee, cocoa, and other staples, on a scale hitherto unthought of in those regions Lastly, it is reported on trustworthy authority that a combination is set on foot in the U. States for the purpose of establishing a North American banking, exchange, and commission business in the capital of *H.*, which enterprise would soon remove the chief impediment to the extension of commerce between the two countries

The exports of *H* consist chiefly of mahogany, hides, tobacco, cattle, and indigo, the total value being estimated at about $1,000,000 per annum, while the imports comprise cotton goods, silks, and hardware. There are no official returns of the value of either the imports or exports, owing partly to the customs at the principal ports being farmed out to individuals whose interest it is to conceal all facts concerning their revenue. The commerce is mainly with Great Britain, the U. States, and Spain, but the value of the trade with this country is not given in the annual statement issued by the Secretary of the Treasury Department, which merges *H.* into "Central America." See GUATEMALA.

Mr. J. J. Valentine, Special Commissioner of the Republic of *H.*, while in New York in 1879, stated as follows the object of his commission to the U. States: "It is to show that, geographically, the Republic of *H.* is the key to Central American trade, and that, therefore, it offers inducements of a peculiar nature to American commerce In cultivating commercial relations between the two republics, great advantages must result to both, and immense profits accrue to the American merchants and manufacturers who appreciate the fact and act accordingly. Goods taken down there may be readily exchanged for the rich marketable products of the country, including the precious metals and high-grade mineral ores Of the Rosario mines, which offer great inducements to investment, the most noted is situated at a distance of only 27 m. from Tegucigalpa, the capital of *H* It is at present worked by the imperfect method known to the natives, which is, of course, far behind the processes used in the U. States. By the present method the ores yield about $100 per ton, whereas, according to assays made by smelting companies here, they can, by the aid of proper machinery, be made to pay from $150 to $4,000 per ton, and 30 or 40 times the amount of ores now extracted could be taken out. Dr R. Fritz Gaertner, lately of the office of the State Geologist, of Albany, and who is now at the head of the geological and mineralogical departments of the *H* government, calculates that at the Rosario mining district there are visible on the surface veins of sufficient magnitude to require at least 150 years to exhaust them. According to his estimates a single company, whose claim is already in working order, will net a dividend of something like $1,000,000 annually I speak of these mines to show the fine field which *H* offers in this branch to American industry. There are several other interests equally inviting to intelligent labor. The balance of exchange in products as between Central America and the U. States is in favor of the former in the proportion of seven to one, while, in fact, it should be the reverse. Europe supplies the great bulk of merchandise to those countries, and it is found by experience that while America is represented by a small fraction of goods imported to Central America, that fraction is undeniably of far better quality than that which comes from the Old World. Now, as the distance between this country and Central America is much shorter than between the latter and Europe, it is reasonable to suppose that America should step in and make this remunerative trade her own. I need not say that the capital and skilled labor of the U. States which are seeking remunerative employment would find a ready market for their commodities in *H.* Agriculture and mining there offer inducements superior to any other Central or South American country, under particularly favorable climatic conditions and liberal laws, and I am empowered by the government to make concessions of valuable coffee and other agricultural lands, with the simple provision that the grantees settle upon them within a reasonable time. I purpose returning shortly to *H.*, and will take with me a committee consisting of Captain Charles P. Dahlgren and Captain Peter Hagan, the latter of Albany. These gentlemen will examine and report upon the mineral and agricultural lands which I am empowered to offer. The new constitution of *H.* guarantees to the emigrant and his personal effects exemption from import duties, also the free importation of implements and instruments necessary to the exercise of his calling, besides the enjoyment of the same civil and religious prerogatives as are enjoyed by the people of the country. They will be granted the right to vote, exemption from taxes and contributions of all kinds, as well as exemption from military service and perfect liberty in the exercise of their religious faith. No instance can be cited wherein the person or property of foreigners has been molested, unless they mixed too much in politics. The foreigner and his goods have always been considered sacred by belligerent parties. Through the worst periods in Central American history Europeans have traded unmolested, and I can cite half a dozen houses in Tegucigalpa alone that enjoy an almost unlimited European confidence. I can speak confidently for *H* in saying that war times have passed for Central America. By a liberal and intelligent policy the present government has succeeded in gaining the confidence of the people, and no public disturbance of any kind need now be apprehended. President Soto is so popular and progressive in his ideas that peace and progress may naturally be looked for throughout the land He has established a system of public schools, with teachers from the U. States; he has built telegraphic lines, opened up mail communication in the republic, and advanced its condition far beyond anything it had formerly attained. No part of the country is more unhealthy than the Mississippi Valley, and the marshy district occupies relatively a much smaller territory. Tegucigalpa, the present capital of *H.*, derived its name from the Indian words 'Tagus-galpa,' meaning mountain of silver, which is characteristic of the district where it is situated. The minerals that can be most profitably worked in *H.* are gold, silver, copper, iron, lead, coal, and opals, and the vegetables are generally those of the temperate and tropical regions. The cultivation of coffee is an immensely remunerative branch of industry. Then there are hides, furs, gums, oils, resins, and precious woods that can be exported in abundance. I have here a small number of samples of the products of the country which American merchants can examine when they desire. I expect that the first vessel will soon sail to the north coast of *H.* with implements and goods for the country, and the government will do everything that can be accomplished to facilitate the growing trade with American merchants." It is scarcely necessary to remark that the above lines, coming from a native writer, whose object was to promote emigration to *H.*, may contain a too favorable view of that Central American country. On some points Mr. Valentine may have taken his patriotic aspirations for actual facts; but *H* is still so little known, that it would be difficult either to endorse or criticise the statement of the Hondurian commissioner

Honduras (British) is a British colony occupying a portion of the peninsula of Yucatan, on the W. coast of the Caribbean Sea, between lat. 15° 55′ and 18° 30′ N.; lon. 88° 5′ and 89° 45′ W. The boundaries of the colony are Mexico on the N., on the S. Guatemala and the river Sarstoon, on the W. Guatemala, on the E. the Caribbean Sea. Its extreme length is 158 m., and its extreme width 60 m., with an area of about 6,400 sq m., and population (1877) 26,000, of whom only 390 are whites. The country is generally flat and swampy on the coast, but rises gradually towards the interior, where the Coxcomb mountains rise to a height of

4,000 feet. In 1850, when the Clayton-Bulwer Treaty was under discussion, it was stipulated that the promise of Great Britain not to colonize or occupy Nicaragua, Costa Rica, and the Mosquito territory, or any part of Central America, did not apply to the settlement of British Honduras. In the forests are found the cedar, mahogany, rosewood, pine, and other useful timber, the india-rubber and gutta-percha trees, with the sarsaparilla, agave, indigo, and numerous useful plants and shrubs. The cocoa-nut flourishes on the coast. The usual varieties of tropical fruits, cereals, and vegetables yield abundantly, and the rich soil of the valleys and lower plains produce luxuriant crops of sugar-cane. About 2,500 tons of sugar are yearly exported. The commerce is chiefly with Great Britain.

Belize, the capital and only town of the colony, stands on a low flat shore immediately open to the sea, and guarded by numerous small islands, densely covered with trees and shrubs, and so similar as to render the navigation extremely difficult It is further divided into two parts by the river, which is crossed by a substantial wooden bridge of 220 feet span and 20 feet in length. The part of the town which is situated upon the S bank of the river is completely insulated by a canal on its W. side, which runs across from a small arm of the sea, and bounds the town on its S. side. The whole town is embowered in groves and avenues of the cocoa-nut and tamarind trees Fort George is situated about half a mile from the river, on a small low islet. In the neighborhood of Belize the natural heat of the climate is tempered by the sea-breezes that prevail during nine months in the year, so that, even in the hottest season, the thermometer seldom rises above 83° F, and during the wet season it sinks to 60° In June July, August, and September, heavy and frequent rains fall, and these are the most unhealthy months of the year, from the decomposition of animal and vegetable matter in the adjacent lowlands and swamps Pop 6,614.

Hone, a whetstone; a talcky slate-stone, wrought into the form of straight slabs, and used for whetting or sharpening the edges of tools after they have been ground. There are different kinds of hones, most of which are moistened with oil when used, and are hence called *oil-stones*

They consist, chiefly, of the following. 1 *Norway rag stone*, the coarsest variety of the hone-slates; it gives a finer edge than the sandstones 2 *Charnley Forest stone*, which is used as a substitute for Turkey oil-stone. 3. *Ayr stone, Scotch stone*, or *slate-stone*, used for polishing marble and copper plates, but the harder kinds for whetstones. 4. *Idwall*, or *Welsh oil-stone*, used for small articles of cutlery. 5. *Devonshire oil-stone*, for sharpening thin-edged broad tools 6. *Cutlers' green-stone*, from Snowdon, which is very hard and close, and is used for giving the last edge to lancets, etc 7 *German razor-hone*, used almost entirely for razors It is obtained from the slate mountains near Ratisbon, where it forms a yellow vein in the blue slate It is sawn into thin slabs, and cemented to a slab of slate, which serves as a support 8. *Blue polishing-stone* a dark slate of uniform texture, used by workers in silver and some other metals for polishing off the work 9. *Gray polishing-stone*, somewhat coarser than the blue 10 *Welsh clearing-stone*, a soft variety of hone-slate used by curriers for giving a fine edge to their broad knives. 11 *Peruvian hone*, for sharpening large tools. 12 *Arkansas stone*, from North America 13. *Bohemian stones*, used by jewellers — *Turkey oil-stone* is superior to every other substance as a whetstone; it will abrade the hardest steel, and is sufficiently compact to resist the pressure required for sharpening a graver The black variety is somewhat harder than the white. These stones are imported from Turkey in irregular masses, seldom exceeding 3 inches square and 10 inches long, and are cut up by means of the lapidary's splitting-mill and diamond-powder, then rubbed smooth with sand or emery on an iron plate, inlaid in wood, and secured by glazier's putty Sperm or neat's-foot oil, or some oil which does not readily thicken, should be used with them. Oil-stone powder is used for grinding together the brass or gun-metal fittings of mathematical instruments, and also instead of pumice-stone for polishing superior brass-work. *Imp.* free.

Honey [Fr. and Sp. *miel;* Ger. *Honig;* It. *mele*], a vegetable juice collected by bees. It varies according to the nature of the flowers from which it is collected. Thus, the *H.* of Minorca, Narbonne, and England are known by their flavors; and the *H.* prepared in different parts even of the same country differs. It is separated from the comb by dripping and by expression: the first method affords the purest sort, the second separates a less pure *H.*; and a still inferior kind is obtained by heating the comb before it is pressed. When obtained from young hives, which have not swarmed, it is denominated *virgin H.* It is sometimes adulterated with flour, which is detected by mixing it with tepid water. the *H.* dissolves, while the flour remains nearly unaltered. Bee-keeping is a branch of agriculture of great importance in some of our States, but as few bee-keepers keep an account of the product of their hives, the returns of the yield of *H.* are very imperfect. The average yield of *H.* throughout the U. States is 22.8 pounds per hive. The average price is 20 to 25 cents per pound. Considerable quantities of *H.* are imported from the West Indies, chiefly from Cuba. *Imp.* duty, 20 cts. per gallon.

In *Pharmacy*, *H.* are minor preparations, now almost superseded by sirups.

Honeycomb, the waxen cells made by bees in their hive, for depositing their honey, forming, when purified, the beeswax of commerce (see BEESWAX). — A flaw in a metallic casting.

Honey-Dew, a kind of tobacco which has been moistened with molasses.

Honey-Sugar, the saccharine principle of honey, extracted from flowers and flowering shrubs by bees.

Hong, a trading factory at Canton; a mercantile house. — One of a class of licensed merchants, who had, until of late years, the monopoly of foreign trade at the chief Chinese ports.

Hong-Kong, a British colony, consisting of an island situated off the S. E. coast of China, at the mouth of the Canton River, in lat. 22° 15′ N., lon. 114° 11′ E. It is about 8 m. long and 5 wide, and comprises, with Kowloon, an area of 32 sq. m., and a population of 124,198, of whom 5,931 are whites (133 from the U. States), 2,823 Indians, and 115,-444 Chinese. It is separated from the mainland of China by the narrow strait of Ly-ee-moon Pass. *H.-K.* is one of those islands called by the Portuguese "Ladrones," or "Thieves," from the notorious habits of its old inhabitants. The colony, which is described as exceedingly beautiful, possessing one of the finest harbors in the world, surrounding picturesque hills rising between 1,000 and 2,000 feet high, is a military and naval station for the protection of British commerce, and it is the centre of trade in many kinds of produce, — chiefly opium, sugar, flour, oil, amber, cotton, ivory, betel, sandal-wood, rice, tea, woollens, silks, salt, etc. *H.-K.* has neither agriculture nor manufactures, and produces little. It possesses, however, excellent docks, capable of holding the largest vessels. The city of Victoria faces the anchorage, and the cession in 1860 by the Chinese of a part of the mainland on the opposite shore, called the Peninsula of Kowloong, places both sides of the harbor under British jurisdiction.

The prosperity of *H.-K.* is the result of its establishment as a free port at the gates of China. The number of foreign vessels trading regularly from *H.-K.* is considerable, but the annual aggregate is swollen by the number of small vessels under the Hanseatic and other European flags, which make short coasting voyages. These monopolize in a great measure the carrying trade of pulse and bean-cake from the northern to the southern ports of China, and the transport of camphor and other products of Formosa. The rapid development of steam traffic tends to interfere with the larger sailing vessels, though at certain seasons considerable employment is found for the latter in the transport of rice from Indian and Burmese ports to *H.-K.* The emigration of Chinese to California employs a respectable amount of tonnage. Several great and competing steam-lines connect *H.-K.* with San Francisco and Europe. Daily steamers connect *H.-K.* with Canton.

No port charges of any description are levied upon European vessels. A copy of the harbor regulations is presented to the master of every merchant vessel on her entering the port. The method of conducting business at *H.-K.* is precisely similar to that at Canton. See CHINA (Canton).

The commercial intercourse of *H.-K.* — virtually a part of the commerce of China — is chiefly with Great Britain, the U States, and Germany, Great Britain absorbing about one half of the total imports and exports. There are no official returns of the value of the imports and exports of the colony from and to all countries, but only mercantile estimates, according to which the former averages $20,000,000 and the latter $10,000,000.

The commerce of *H.-K.* with the U. States is considerable. For the year 1878 the value of the imports from this country was $8,591,158, and the exports to the U. States $2.232,663. The principal articles of imports and exports were as follows: *Imports:* Books, etc., $10,219; wheat and wheat flour, $1,217,661; clocks, $26,489; copper in bars, $10,723; drugs, etc., $20,261; fruits in cans, $22,097; ginseng, $454,037; gold and silver bullion, $1,481,564; gold coin, $127,912; silver trade dollars, $3,733,943; lead, $256,168; mineral oil, $98.125; cured fish, $268,011; potatoes, $11,797; quicksilver, $780,323; scales, $13,905. — *Exports:* Camphor (968,975 lbs.), $140,339; chemicals, $17.881; volatile oils, $42,666; raw silk, $36,002; tea (805,475 lbs.), $145,064; rice, $35,787; china ware, $32,614; spices, $230,200; straw and palm-leaf (manuf.), $441,908; brown sugar (19,332,706 lbs.), $850,657; cabinet ware, etc., $10,245.

In 1878, 18 American sailing vessels (tonnage 60.992) and 12 steamers (tonnage 54,966) entered, and 45 American sailing vessels (tonnage 83,296) and 11 steamers (tonnage 21,922), cleared the harbor of *H.-K.*

Money. The Mexican dollar of 100 cents = $1.015 is the only legal tender of payment for sums above 200 cents; but silver dollars, bearing the effigy of the British sovereign, are issued from the *H.-K.* mint.

Weights and Measures —

The *Tael*	=	$1\frac{1}{3}$	oz. avoirdupois
" *Picul*	=	133	lbs. "
" *Catty*	=	$1\frac{1}{3}$	lbs. "
" *Chih*	=	$14\frac{1}{10}$	inches.
" *Chang*	=	$11\frac{3}{4}$	feet.

Besides the above weights and measures of China, those of Great Britain are in general use in the colony.

Honiton Lace, a pillow or cushion lace made in Devonshire, England, remarkable for the beauty of its figures and sprigs, which are sewed on to net by the needle.

Honley, a woollen fabric made chiefly of shoddy.

Honolulu. See HAWAIIAN ISLANDS.

Hoobaballi, a close, fine-grained wood of Guiana. It is easily worked, and takes a high polish.

Hood, a slight covering for the head, worn by females. — Any covering resembling a hood, or answering the purpose of a hood, as the head of a carriage. — A companion-hatch, sky-light, etc. — A young seal.

Fig. 272. — CHINESE MOSQUE.

Hooding, a piece of rough leather, connecting the hand-staff and swingel of a flail.

Hooding-Ends, the ends of planks which fit into the rabbets of the stem and stern posts of a ship.

Hoof, the horny protection that covers the feet of many domestic and wild animals, as the horse, ox, deer, etc. They are largely employed in making the coarser kinds of handles, combs, and buttons; and chemically they are found to be the cheapest substance from which prussiate of potash can be obtained. *Imp.* free.

Hoohoo, a piece of checked cotton, used in the African trade.

Hook, a piece of iron, or other metal, bent into a curve for catching, holding, or sustaining anything. — An instrument to cut or lop with; a sickle; as a reaping-hook, a bill-hook. — That part

of a hinge which is fixed or inserted in a post or upright. — A forked timber placed on the keel of a ship. See FISH-HOOK.

Hookah, an East Indian pipe, of several parts; the bowl is of silver, shell, earthenware, etc.; the stem, or tube, of cocoa-nut, or some other wood, which a snake, or pliable ornamental tubing, lengthens out into several coils, and the smoke passes through a glast water-vase, while the mouthpiece is of amber, silver, etc.

Hook-and-Eye, metal catches, for fastening into each other. They are bent and cut in a press. *Imp.* duty, according to material.

Hook-Ladder, a small ladder with hooks at the top.

Hoondee, an East Indian draft or bill of exchange, drawn by or upon a native banker or shroff.

Hoop, a circular band of wood or metal, used to confine and hold together the staves of casks, kegs, tubs, etc. — A circular framework of some elastic material, as whalebone, steel, etc., used for expanding the skirt of a woman's dress.

Hooping, in founding, the iron-work around a moulding-box.

Hoop-Iron, flat, thin bar-iron.

Hop [Fr. *houblon;* Ger. *Hopfen;* It. *lupolo;* Sp. *lupulo, oblon*]. The hop-vine (*Humulus lupulus*) is a native of Europe, and is probably also indigenous in North America, as it has been found growing apparently wild on the banks of the Mississippi and Missouri. It is extensively cultivated for its strobiles. or cones, so largely employed in the preparation of malt liquors. These strobiles, or female catkins, when fully ripe, are picked from the vines and dried in kilns. Hops consist of thin, translucent, veined, leaf-like bracts or scales, of a greenish-yellow color, having near their base two small, round, dark seeds. Hops are somewhat narcotic, and their odor fragrant, the taste bitter, aromatic, and slightly astringent. These properties are owing to the presence of a peculiar resinous secretion in the glands, which has been called "lupulin." Ale and porter owe their bitter flavor and tonic properties to the hops added to them during the process of brewing,— about one pound of hops being added for every bushel of malt. After the hops have been picked and dried, the brightest and finest are put into pockets or fine bagging, containing about 180 lbs., and the brown into coarse or heavy bagging. The former are chiefly used in the brewing of fine ales, and the latter by the porter brewers. A *pocket* of hops, if they be good in quality, well cured and tight trodden, will weigh about 1½ cwt.; and a *bag* of hops will, under the same conditions, weigh about 2¼ cwt. If the weight of either exceeds or falls much short of this medium, there is reason to suspect that the hops are of an inferior quality, or have been badly manufactured. The brighter the color of the hops, the greater is the estimation in which they are held. The fine flavor or aroma of hops does not exist a year. Beyond that time they become *old hops*, and are sold at a much cheaper rate. A year or two longer, and the bitter itself disappears, and the whole becomes nothing better than chaff. A considerable and gratifying increase has taken place in the last few years in the culture of this useful article in the U. States, chiefly in New York and Wisconsin. In 1868 we had to import from Europe 3,270,995 lbs. of hops, valued at $859,316; while in 1878, notwithstanding the immense increase in the manufacture of beer, and the consequent increase in the consumption of hops, our export of hops (chiefly to England) amounted to 18,458,782 lbs., valued at $2,152,873. American hops are packed in bags containing 200 lbs. *Imp.* duty, 5 cts. per lb.; roots for cultivation, free.

Hop-Hornbeam, a name for the iron-wood (*Ostrya Virginica*).

Hope, a fire-insurance Co., located in New York City, organized in 1856. *Statements*, Jan., 1879: Cap. stock paid up in cash, $150,000; net surplus, $15,908.52; risks in force, $6,138,011; premiums, $35,454.51; premiums received since the organization of the Co., $1,951,798.14; losses paid, $1,210,428.53; cash dividends paid to stockholders, $200,500.

Hop-Oast, a kind of kiln for drying hops.

Hopper, a wooden trough or funnel, through which grain passes into a mill to be ground: so called from its *hopping* or leaping motion. — A basket or utensil in which seed-corn is carried for sowing. — In the glass-trade, a conical vessel, suspended from the ceiling, containing sand and water for the use of the cutter. — A box with a bottom in the form of an inverted truncated pyramid, with a trap-door for closing the opening, used for weighing grain and other articles. When full the trap is opened and the contents allowed to run out.

Hopple, a mode of fettering the fore-legs of animals to prevent them from straying.

Hop-Pole, a pole, or upright, set annually in the ground at the roots of hop-plants for their stems to twine around. When a hop-plantation is first made, as the plants are weak the poles are not required to be more than 5 or 6 feet in length, but in the third or fourth year they require to be 10 or 12 feet in length. Any kind of young trees or saplings may be used as hop-poles; but the most durable are those of the oak, the ash, the sweet-chestnut, and the larch.

Hordeine, the starchy matter of barley.

Horehound, a wild herb, the *Marrubium vulgare*, which has long been a popular remedy in chronic pulmonary complaints, etc.

Horizontal Water-Wheel, a wheel (Fig. 173) running on a vertical axis, and having radial floats shaped so as to present a concave and oblique surface to the stream of water dashed upon them

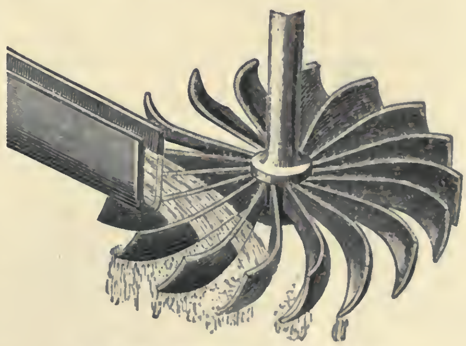

Fig. 278. — HORIZONTAL WATER-WHEEL.

from a great elevation. This form of wheel is useful in places where there are not better mechanical appliances at hand.

Horloger [Fr.], a maker or vender of clocks and watches.

Horn [Fr. *corne;* Ger. *Horn*], a substance too well known to require any description. The *H.* of various animals, chiefly those of the ox, cow, bison, buffalo, chamois, antelope, goat, and sheep,

are manufactured into a great variety of useful forms.

The manufacturer first detaches the *H.* from the bony core by macerating the *H.* in water for a month or six weeks, when the membrane by which the *H.* is attached to the core putrefies and allows the two to be separated. The ash of the cores makes excellent cupels for the assay of gold and silver. The solid tips of the *H.* are sawn off, and are used for handles for knives, for buttons, etc.; the other portion of the *H.* is cut into short lengths, or soaked whole in boiling water, or heated at a fire, the effect of which is to soften it, and allow it to be spread out nearly flat. The *flats* are next pressed between warm and greased iron plates, the pressure varying according to circumstances. If intended for lanterns, the pressure is continued until the *H.* separates into distinct plates; these are placed on a board covered with hide, and scraped with a knife having a wire edge. Some of the shavings which come off are sometimes dyed and cut into various forms, and are so sensitive as to curl up by the warmth of the hand. They are sold at toy shops under the name of "sensitive leaves." After the scraping, the sheets of *H.* are polished with a woollen cloth dipped in charcoal dust and water, next with rotten-stone, and lastly with *H.*-shavings. The effect of heat and pressure on light-colored *H.* is to render it transparent; but most of the articles made of *H.* are colored artificially by boiling the *H.* in infusions of coloring matter. If the *H.* be intended for combs, the pressure must be moderated or the teeth will be brittle; if intended for drinking-cups, the *H.* is cut into lengths, scalded, roasted, and moulded in a cone of wood, and a wooden plug is driven into it for pressing the *H.* into the required shape. After this the cup is turned and polished at the lathe, and a groove is cut to receive the bottom; this being cut out of a flat piece of *H.* by means of a crown-saw, and the bottom of the cup having been softened at the fire, the disk is forced into the groove, and the *H.* contracting in cooling makes a water tight joint. For knife-handle and similar works the *H.* is cut nearly to the required form, and is moulded in dies with the assistance of heat and a powerful screw-press. The work is finished by scraping and buffing with Trent sand and oil, or rotten-stone and oil. *H.* is sometimes used as a vehicle for applying polishing powders to the flat works of the watchmaker. *H.* easily takes color throughout its entire substance by boiling in colored infusion. An *imitation of tortoise-shell* is produced by heating *H.* with a hot solution of dragon's blood, litharge, and pearl-ash, applied to those parts which are to be reddish brown, but not to those which are to be yellow. The parings, turnings, filings, and other fragments of *H.*, like those of tortoise-shell (see TORTOISE-SHELL), can easily be softened, and worked up into useful and ornamental forms by pressure Even if this is not done, nothing need be wasted, seeing that the manufacturing chemist can obtain useful substances by decomposing the *H.* The actual waste in manufacturing is becoming less and less.

The value of horns, horn-tips, and hoofs imported in the year 1873 was $378,850. *Imp.* duty: unmanufactured, free; *H.* strips and tips, free; *H.* combs (see COMBS); manuf. of *H.*, 35 per cent.

Horn, a musical wind-instrument, made originally of horn, but now of metal, mostly of brass. There are many forms of horns, known under various names; as, a trumpet, a cornet-à-piston,

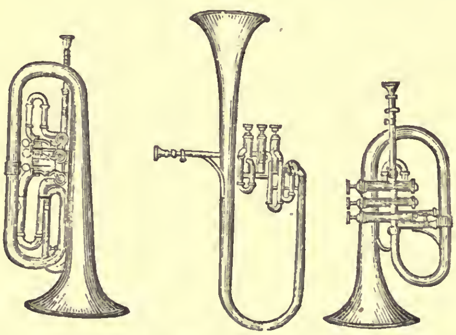

Fig. 274. — SAX-HORNS.

an ophicleide, a trombone, a hunting-horn, a bugle-horn, etc. The Sax-horns, three of which are represented in Fig. 274, are made *en suite*, so as to take in a concerted piece of music the different parts of soprano, contralto, tenor, bass, double-bass, etc. *Imp.* duty, 30 per cent.

Hornbeam, the wood of the *Carpinus Americana*, which is used for the cogs of mill-wheels and for agricultural implements. The inner bark dyes yellow.

Horn (Cape), commonly considered the southern extremity of America, is not a part of that continent, but the most southerly point of a small island of the Terra del Fuego group. Lat. 56° 58′ 40″ S., lon. 67° 16′ W. It consists of a lofty, precipitous, bare black rock, running far out into the sea, and was formerly considered dangerous to pass on account of the strong westerly gales that prevail in its neighborhood during summer; but as these are restricted to the vicinity of the Cape, vessels avoid the difficulty by sailing in a higher latitude.

Horner, a worker in horn.

Horn-Lantern, a lantern having plates or sheets of thin pressed horn in the frame, instead of glass.

Horn-Lead, native chloride of lead, so called from its consistence.

Hornpipe, an old Welsh musical instrument, consisting of a wooden tube with holes, and a reed and a horn at each end.

Horn-Quicksilver, the native bichloride of mercury, or calomel.

Horns, a miner's name for the guides for the ropes on the drum.

Horn-Silver, native chloride of silver, a transparent, waxy-looking mineral, of a gray, grayish-green, or whitish color. It occurs with native silver in the mines of Mexico, Chili, Peru, Idaho, Nevada, Arizona, etc.

Hornstone, a kind of quartz resembling horn, used for forming the grinding-blocks of flint-mills in the pottery manufacture. See CHERT-STONE.

Horn-Tips, the solid, pointed tops of horns, which are used for umbrella-tops, knife-handles, and many other purposes.

Horography, the art of constructing dials.

Horologer, a watchmaker.

Horology is the art of making time-measuring instruments. These instruments, and matters relative to them, are treated under ALARM-BELL, BARILLET, CHRONOMETER, CLOCK, ELECTRIC CLOCK, ESCAPEMENT, FUSEE, PENDULUM, SUN-DIAL, WATCH, etc.

Horometer, any instrument for measuring the hours, as a clock, a watch, a sun-dial, etc.

Horometry, the art of measuring time by hours and subordinate divisions.

Horse [Fr. *cheval;* Ger. *Pferd;* It. *cavallo;* Sp. *caballo*], a noble quadruped (*Equus caballus*), whose beauty, strength, and docility have connected him, directly or indirectly, with almost all the purposes of life. The *H.* is strictly herbivorous. His stomach is comparatively small, and he eats often. He sleeps very little, and frequently standing. The foal is used for work when about 3 years old. The *H.* lives for 20 years, but is seldom capable of much work after 15. The age can be ascertained by the teeth till the eighth year, after which it is said to be "past mark." In old animals, however, the gums shrink from the teeth, which are left very long, and become of a yellow or brown color. The *H.* is vastly modified in his form and character by the physical condition of the countries in which he is naturalized. The pony of Norway or of the Highlands of Scotland and the huge *H.* of the plains present extremes of strength and size; while, again, these contrast in a striking manner with the light form and agile shape displayed by those fed on the arid plains and scanty herbage of warmer countries. To the

intermixture of the last with the former the technical term *blood* is applied. Importations of them to England anciently took place from Spain and Barbary, and at a later period from Arabia. The African and Arabian *H.*, accordingly, have given their characters to the blood-horse of England and its innumerable varieties. The animal in which this effect of blood is the most remarkable is the English race-*H.* For the combination of speed with the necessary strength, this creature can scarcely be surpassed. He forms, however, a race of artificial creation, admirably suited for a particular purpose, but not otherwise deserving of cultivation, except from this, that it is the stallions of this race that continue the excellence and purity of the parent stock The hunter combines the blood of the Arabian and other races of the South and East with the powerful form of the *H.* of the N. of Europe in a much happier proportion than the race-*H.* From the hunter downwards to the races where no mixture of southern blood can be traced the gradations are innumerable. It is in this class that the English road *H.* and hackneys, the horses employed in coaches and carriages of all kinds, are contained. It forms the most numerous class of English *H.* But a large proportion is bad, having lost the hardiness and strength of the native race, without having arrived at the speed and other qualities of good breeding. The remaining class of English *H.* consists of those in which no mixture, or a very slight one, of stranger blood is found. These are the ponies of the highlands, or the larger *H.* of the plains. Of the last, usually termed cart or farm horses, the most commonly enumerated breeds are: (1) The Old English black horse, of very large size, chiefly bred in the midland counties, from Lincolnshire to Staffordshire; (2) the Clydesdale, or breed of the central plains of Scotland; (3) the Cleveland Bay, the origin of the better kind of coach-horse, bred over the whole of Yorkshire and Durham; and (4) the Suffolk Punch, so termed from its punchy form. — The first *H.* brought to America from Europe were imported by Columbus, in his second voyage, in 1493. The first *H.* brought into any part of the territory at present embraced in the U. States were landed at Florida, by Cabeça de Vaca, in 1527, 42 in number, all of which perished or were otherwise killed. The next importation was also brought to Florida, by De Soto, in 1539. The principal breeds of *H.*, adapted for specific purposes, in the Middle, Northern, and Western States, are the Norman, the Canadian, the Morgan, the Conestoga or Pennsylvanian, the Virginian, and the Kentuckian. For carriages of heavy draught the Conestogas are regarded by many as the best. For the saddle, draught, and other useful purposes the Morgans are highly prized, especially in New York. For roadsters, the Normans and Canadians are frequently sought. For blood, the Virginians and Kentuckians generally take the lead. Vermont has long been celebrated for its trotting horses, and the *Morgan breed* is so identified with that State, that the name is almost a synonyme for horses raised there. In New York, however, the greatest attention is paid to the business, the single county of Orange having over 100 breeding establishments, some of which are very extensive. Millions of dollars are also invested on stock farms all along the Hudson River in the breeding of trotting horses. There are similar breeding establishments in Iowa and other Western States. For the last 30 to 40 years the value of trotting horses has increased even faster than their number and speed, the rate being at least 100 per cent every decade. In 1858, Flora Temple was sold for $8,000; in 1862, the California Damsel for $11,000, in 1866, Young Pocahontas for $35,000; and in 1867, Dexter, which in that year surpassed all previous speed, — trotting a mile in 2 minutes 17¼ seconds, — sold for $33,000. It is now no unusual thing for fast-trotting horses and fine stock horses of the best trotting blood to sell for from ten to twenty thousand dollars. This shows the immense popularity of the American breed of trotting horses, and the amount of wealth they represent. The founder of this breed seems to have been Messenger, whose lineage is traceable back to some of the finest Arabian blood in England. He was imported into New York in 1788, and was of superb form and extraordinary power and spirit. His form, with the remarkable vitality and endurance of his race, has endowed his progeny — which has been persistently used and trained to trotting — with extraordinary courage and endurance. So great has been the impress of this wonderful stamina and splendid form upon American horses, that his value to the country may be estimated at millions of dollars. His stock has been bred in-and-in to an unprecedented degree, without any of the disastrous effects generally feared from inbreeding. This success has led many to think that where sire and dam are affected with no disease, inbreeding may be resorted to with safety, the only effect being to intensify in the progeny the characteristics common to both parents. The following table shows the estimated number, average price, and value of the *H.* existing in the U. States on January, 1879: —

STATES.	Number.	Average price.	Value.
Maine	81,700	$62 45	$5,102,165
New Hampshire	57,100	59 69	3,408,299
Vermont	75,900	64 82	4,919,838
Massachusetts	132,300	87.46	11,570,958
Rhode Island	16,200	93.35	1,512,270
Connecticut	51,500	75.17	3,871,255
New York	890,000	80.77	71,885,300
New Jersey	114,500	92.12	10,547,740
Pennsylvania	614,500	72 07	44,840,065
Delaware	19,900	70.90	1,410,910
Maryland	108,600	68.55	7,444,530
Virginia	204,600	62 60	12,807,960
North Carolina	142,400	67.11	9,556,464
South Carolina	57.900	80.72	4,673,688
Georgia	118,300	70.77	8,372,091
Florida	22,200	70 09	1,555,998
Alabama	108,500	58 91	6,391,735
Mississippi	95,300	65.62	6,253,586
Louisiana	78,500	53 24	4,179,340
Texas	725,000	27 45	19,901,250
Arkansas	165,200	45.23	7,471,996
Tennessee	327,500	52 91	17,328,025
West Virginia	117,500	52 32	6,147,600
Kentucky	379,300	49 11	18,627,423
Ohio	765,000	60 74	46,466,100
Michigan	314,900	73 75	23,223,875
Indiana	668,800	51 22	34,255,936
Illinois	1,091,500	54.84	59,857,860
Wisconsin	362,600	64 88	23,525,488
Minnesota	215,000	66.40	14,276,000
Iowa	734,100	56 33	41 351,853
Missouri	604,800	41 61	25,183,872
Kansas	236,400	51.34	12,136,776
Nebraska	116,500	67 68	7,884,720
California	262,600	40 94	10,750,844
Oregon	101,600	48 56	4,933,696
Nevada	11,500	52.25	600,875
Colorado	50,000	45 00	2,250,000
The Territories	90,000	43 17	3,885,300
Total	10,329,700	....	$600,813,681
General average price	....	$58.16	....

Our export of *H.* (mostly to England) for the year 1878 amounted to 4,104, valued at $798,723 *Imp.* duty, 20 per cent.

There are few sources of greater annoyance, both to the buyer and the seller of the *H.*, than disputes with regard to *soundness.* That *H.* is sound in whom there is no disease, nor any alteration of structure in any part which impairs, or is likely to impair, his natural usefulness. That *H.* is unsound that labors under disease, or that has some alteration of structure that does interfere, or is likely to interfere, with his natu-

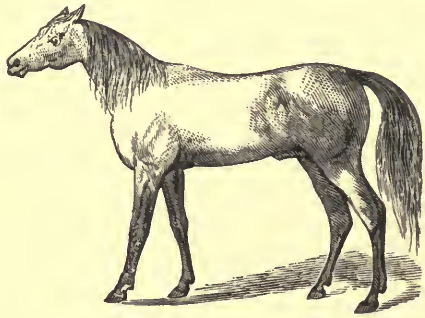

Fig. 275. — Arabian Horse.

ral usefulness. In the purchase of a *H.*, the buyer usually receives, embodied in the receipt, what is termed a *warranty.* It should be thus expressed: —

" Received of A B $200 for a gray mare, warranted only five years old, sound, free from vice, and quiet to ride and drive.
" C. D."

A receipt including merely the word " warranted," extends only to soundness, — " warranted sound " extends no further; the age, freedom from vice, and quietness to ride and drive, should be specially named. This warranty extends to every cause of unsoundness that can be detected, or that lurks in the constitution at the time of sale, and to every vicious habit which the animal has hitherto shown. To establish a breach of the warranty, and to be enabled to return the *H.* or recover the price, *the purchaser must prove that it was unsound or viciously disposed at the time of sale.* In case of cough, the *H.* must have been heard to cough previous to the purchase, or as he was led home, or as soon as he had entered the stables of the purchaser. Coughing, even on the following morning, will not be sufficient; for it is possible that he might have caught cold by change of stabling. *No price will imply a warranty*, or be equivalent to one; there must be *an express warranty.* The warranty should be given at the time of sale. A warranty, or a promise to warrant the *H.*, given at any period antecedent to the sale, is invalid. A warranty after the sale is invalid, for it is given without any legal consideration. In order to complete the purchase, there must be a transfer of the animal, or a memorandum of agreement, or the payment of earnest-money; the least sum will suffice for earnest. No verbal promise to buy or to sell is binding without one of these. Where there is no warranty, an action may be brought on the ground of fraud, but this is very difficult to be maintained, and few possibly will hazard it. It will be necessary to prove that the dealer knew the defect, and that the purchaser was imposed upon by his false representation; and that, too, in a case in which a person of ordinary circumspection might have been imposed upon.

Horse, a wooden frame for towels or clothes. — A stool or tressel used by many workmen. — The carrying part of a machine, as in tile-making. — A foot-rope to support the feet of seamen while leaning over a yard or boom to furl the sail. — A large round bar of iron fixed in the head of a ship.

Horse-Barge, one towed by horses on a canal or narrow river.

Horse-Bazaar, a place for the sale of horses.

Horse-Bean, a species of *Faba* grown in fields for feeding horses, and of which there are several varieties.

Horse-Blanket, a coarse woollen rug with which to clothe horses.

Horse-Boat, a ferry-boat for transporting horses across rivers or harbors, etc.

Horse-Box, the English term for a closed carriage or vehicle for transporting horses by railway; an enclosure for a horse to be slung into a vessel.

Horse-Breaker, one who tames and trains young horses for the saddle or draught.

Horse-Chestnut, a very ornamental tree, the *Æsculus hippocastanum*, with an erect trunk, and a pyramidal head, sometimes attaining a height of 90 or 100 feet. The white wood is used for the backs of brushes, and for other ornamental articles. The bark is used in some countries as a febrifuge. The nuts or seeds are large and of a beautiful mahogany color, but exceedingly bitter and unpleasant to the taste. They are of little commercial value. From them, however, starch and vermicelli have been made.

Horse-Cloth, a blanket or wrapper for a horse.

Horse-Collar a stuffed collar, placed around the neck and against the shoulders of a draught horse to pull by.

Horse-Comb, a strong comb used for combing the mane and tail of horses.

Horse-Dealer, as defined by Act of Congress, June 30, 1864, " any person whose business it is to buy or sell horses or mules."

Horse-Doctor, a farrier; a veterinary surgeon.

Horse-Drench, a drastic purge for a horse; also the horn by which the medicine is administered.

Horse-Dung, the droppings from horses, in stables, etc., collected for manure.

Horse-Fair, a market for the sale of horses.

Horse-Fettler, a workman in mines who provides for and attends to the horses kept underground.

Horse-Flesh, a name for a species of Bahamas mahogany. — The carcass of horses sold to the knackers.

Horse-Grease, the melted fat obtained by boiling the carcasses of horses. It is exported from South America under the name of mare's grease.

Horse-Hair, the long hair of the mane and tail of the horse, which is valuable for many trade purposes. See Hair.

Horse-Hide, the skin of the horse, which, when tanned, makes the strong cordovan leather, and is also used for covering large board-room or office tables.

Horse-Hoe, the English name for a Hoeing-Machine.

Horse-Knacker, a purchaser of diseased or worn-out horses, who kills them for their commercial products.

Horse-Load, the weight which a horse can draw, which is about 2500 lbs.

Horse-Mill, a mill worked by a horse.

Horse-Power, a unit of force introduced by Watt to enable him to determine what size of engine to send to his customers to supersede the number of horses which the new power was to replace. Watt accepted the result of certain experiments which seemed to show that the average force exerted by the strongest horse was sufficient to raise 33,000 lbs. one foot high in a minute; thus, an engine of 200 *H.-P.* would be a force equal to that of 200 horses, each lifting 33,000 lbs. one foot high per minute. Watt had two methods of estimating and comparing his engines, *viz.*, by the *power*, and by the *duty.* By the power is meant the quantity of work which an engine can effect in a given time; by the duty is meant the quantity of work which it can effect by a given expenditure of fuel Now, it is evident that without any change in the size of an engine, but simply by increasing the pressure of the steam, the power of an engine may be greatly increased, — that is, the load remaining constant, the speed of the piston may be increased, the number of strokes may be increased, and, con-

sequently, the work done per minute will be increased also. Hence it is difficult to apply a limit to the power obtainable from the smallest cylinder, provided the boiler be large enough to evaporate the increased quantity of water, and strong enough to resist the increased bursting pressure. In fact, no size of cylinder can be reckoned as having a particular power, since the power depends not on size but on strength. Nevertheless, in modern engineering the term *horse-power* refers rather to the size of the cylinder than to the power exerted, and the value of the unit has undergone many changes; so that in a modern engine, a *H.-P.* may imply 52,000 lbs., or 60,000 lbs., or 66,000 lbs., one foot high per minute. The plan now adopted for ascertaining the performances of different engines is by an instrument called an *indicator*. This consists of a small cylinder fitted with a piston, which is pressed down by a spring. By the height to which this piston rises against the spring the steam pressure within the cylinder of the engine is indicated; and the number of pounds pressure on the square inch multiplied into the number of square inches in the area of the cylinder, and by the number of feet travelled through by the piston per minute, gives the efficient moving power, which, divided by 33,000, gives the actual *H.-P.* From the above it results that by improved arrangements in every part a cylinder of a certain capacity will do more work than Watt had assigned to it. Hence a certain *H.-P. nominal* now only denotes a certain capacity of cylinder; whereas the *effective* or *real* power denotes the actual working efficiency. Most engineers now believe that Watt's figures, 33,000 lbs., are too high for a real *H.-P.*; but the *foot-pound* (see HEAT, MECHANICAL EQUIVALENT OF) is still based upon them for the sake of uniformity in statements and tabulations. In the great ocean steamers now built, the nominal and the real *H.-P.* of the engines are both frequently named; and it is observable that they diverge more and more from equality.

Horse-power is also the name given to machines in which the power of horses is used to drive other machinery. Fig. 276 shows a four-horse-power machine having two gears and shafts, so that two different rates of motion may be taken from it. A connection with the *first* shaft gives its tumbling-rod about 10½ revolutions to one round of the horses, or about 30 revolutions per minute. The tumbling-rod, when set on the *second* shaft, gets about 25 revolutions to one round of the horses, or about 75 per minute, and would give the band wheel of jack about 300. This power is adapted to general use on farms, working feed-mills, pumps, saws, etc.

Table showing the estimated Power of Man or Horse as applied to Machinery.

Application of the Power.	Lbs. avr. at the rate of 220 feet per minute.		Lbs. avr. at the rate of one foot per minute.
A man is supposed to be capable of lifting or carrying..............	27.273		6,000
A man is supposed to be capable of turning the winch of a crane with a force equal to.................	28 637		6,300
When the united efforts of two men are applied to the winch of a crane, the handles being at right angles, each man exerts a force equal to........................	33 499	or	7,350
A man is supposed to exert a power in pumping equal to............	17 335		3,814
In ringing, a man exerts a force equal to	38 955		8,570
And in rowing....................	40 955		9 010
The power of a horse is equal to...	150		33,000

Horse-Radish, the pungent root of the *Cochlearia armoracia*, used as a condiment, on account of its pungent, acrid, and stimulant qualities.

Horse-Railroad, a city or suburban railroad, whose cars are drawn by horses.

Horse-Repository, a place where horses are kept on sale and view, or put up at auction periodically.

Horse-Run, a contrivance in deep earthworks for drawing up and lowering a man with a wheelbarrow.

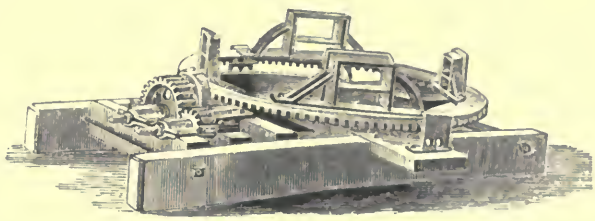

Fig. 276. — DOUBLE-GEARED HORSE-POWER MACHINE

Horseshoe, a semicircular plate of iron nailed to the hoofs of horses to protect the frog or sole of the foot. They are manufactured by machinery on a large scale at Troy, New York. They are forwarded in casks, and sold by the ton or cwt

Horseshoe Nail, a nail with flat pointed tang and heavy counter-sunk head, made of tough iron, and used to fasten horseshoes to hoofs of horses. Their usual lengths are as follows: —

No 5	1½ inches	No 8	2 inches
No. 6	1¾ "	No 9	2¼ "
No 7	1⅞ "	No. 10	2½ "

Horse-Tail. See DUTCH RUSH.

Horse-Trappings, the saddlery and harness for a horse.

Horsewhip, a light whip for horsemen; those for ladies are often very elegantly mounted.

Horticulture, Gardening, the art of cultivating gardens. It differs from agriculture chiefly in the comparatively limited space over which it extends, and in being conducted by manual labor; whilst the latter is performed jointly by human and animal labor, in fields, or on an extensive tract of land called a farm.

Hose, socks, stockings, or coverings for the legs. — Flexible tubing used for the conveyance of water, more usually made of a fabric covered with leather, or coated with india-rubber or gutta-percha.

Hose-Cart, a reel mounted on wheels to carry hose for fire-engine service.

Hoshens, Hoeshens [Scotch], stockings without feet.

Hosier, one who manufactures or sells articles of hosiery.

Hosiery. The word *hose* meant *long stockings*, in regard to the garments of past ages; and on that ground the terms hosiery and stockings became applied indiscriminately. But *H.*, in a manufacturing sense, now means something more than stockings. It is a comprehensive designation for those textile fabrics — for whatever kinds of garment intended — which are made by a sort of *knitting*, or chain-work, unlike the regular long threads and cross-threads of ordinary weaving; and therefore gloves, drawers, under-waistcoats, nightcaps, shawls, etc., are included, as well as stockings, under the name of *H.* The counties of Leicester,

Nottingham, and Derby are the chief seats of this manufacture in England; in the first, woollen *H* is the principal branch; in the second, cotton; and in the third, silk. Woollen hose are also made on a considerable scale in Wales, and at Hawick, in Scotland. The principal seat of the German cotton *H.* is Chemnitz, in Saxony. *Imp.* duty according to material. See Knitting.

Hospital, an infirmary; a public institution for the reception of sick persons. By the laws of the U. States foreign seamen arriving in the U. States pay each 20 cents per month to the collector of the port, as hospital money, and pay 25 cents per day when in hospitals under medical treatment.

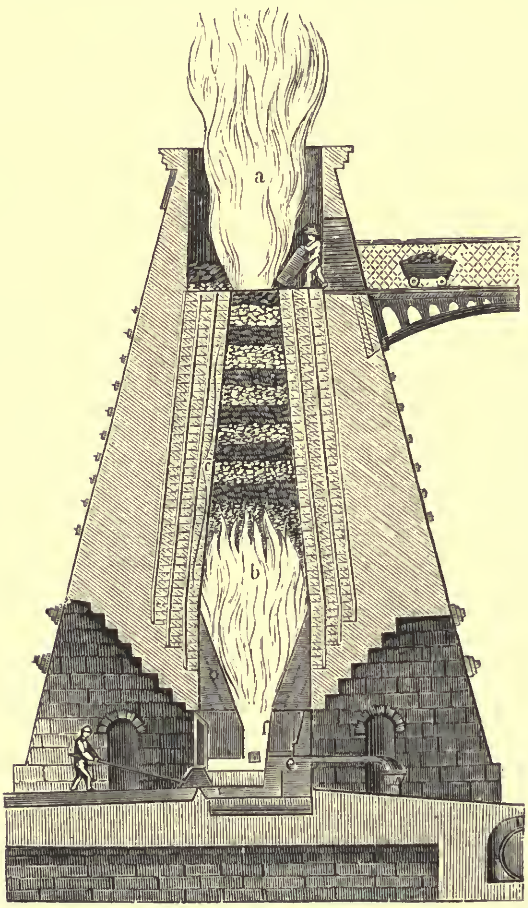

Fig. 277. — Hot-Blast Smelting-Furnace.

Marine hospitals are erected by the U. States at New York, New Orleans, Boston, and other ports, for the accommodation of disabled and sick seamen, under the supervision of the Treasury Department. For disabled naval officers and seamen, navy hospitals have been erected at Philadelphia, Brooklyn, N. Y., Norfolk, and other seaports, supported by grants by Congress, and from contributions of one ration per day from each inmate.

Hot-Bed, a forcing-pit containing horse-dung and other manure, and covered with glass for raising early plants.

Hot-Blast. The air driven into an iron-smelting furnace by the blowing-machine or cold-blast has a tendency, in the first instance, to cool the contents of the furnace by its cold current; and this suggested the probability that it would be worth while to make the air hot *before* admitting it to the furnace. This idea has led to the establishment of one of the greatest improvements in the iron manufacture, — the *hot-blast.* Not only is more fuel saved in the furnace than is used in the preliminary warming of the air, but the contents of the furnace can be raised to a higher temperature, thus permitting the fusion of certain kinds of ore which would be infusible by the cold-blast. But there is more than this. Not only are fuel, lime, and time economized, and otherwise refractory ores brought into use; but coal can be used in addition to, or instead of, coke, with a consequent saving of part of the expense involved in coking. These numerous advantages have brought the hot-blast into a high degree of favor. The air is heated in a kind of stove provided with a series of cast-iron pipes over a fire-place; the air is made to pass through the tubes (which are 6 or 8 inches in diameter, and arranged like vertical siphons) into two horizontal tubes of larger diameter, and thence into a large cylinder. From this cylinder the air is drawn into the cylinder of the blowing-machine, whence it is forced into the blast-furnace (Fig. 277). In most blast-furnaces each tuyère, or nozzle, is provided with its own air-heating apparatus; and from 30 to 35 tons of coal per week will heat to 600° F. sufficient air to make 60 tons of pig-iron. A very scientific mode is sometimes adopted of utilizing the waste heat of the blast-furnace by making it heat the air of the hot-blast. The amount of heat thrown out at the chimney of most of our great furnaces, in the forms of flame and smoke, is something enormous; amounting, it is computed, to 60 or 80 per cent of the whole heat generated in the furnace. Many plans have been proposed, and some of them tried, for saving this valuable but wasted heat for the purpose here named. One of these plans depends upon the construction of peculiar stoves nearly on a level with the top of the furnace. Hot air, from the throat of the furnace, passes through flues into a chamber containing tubes filled with the cold air for the blast; this cold air, being thus heated to 600° F., or more, passes down pipes to the blowing-machine, and thence into the furnace. The hot air of the furnace is not the same air as that of the blast; the former heats the tubes in which the latter is contained. This is rendered possible, because the heat at the throat of the furnace is tremendous, as much as 1800° F. The scientific theory of this mode of hot-blast is complete; the only doubt is in the efficacy of the practical application. Some kinds of iron, nevertheless, are of better quality when smelted by the cold-blast. See Iron.

Hotel, a house for lodging and entertaining travellers. In France, the term is also applied to a private house or large urban mansion.

Hôtel-de-Ville, the city hall of a French town.

Hot-Flue, an apartment heated by stoves or steam-pipes, where goods are dried.

Hot-House, a building constructed in a garden, or elsewhere, and warmed by artificial means, for the purpose of rearing exotics and other tender

plants, which require more heat than our climate affords.

Hot-pressed Paper, paper of which the sheets have been smoothed and glazed by passing them between heated rollers of polished steel.

Hot-Short, a term applied to iron which cannot be easily welded, and has a tendency to crack or break when it is worked at a red heat.

Hot-water Heating Apparatus, a system of pipes for conveying steam or hot water for warming churches and other public institutions, dwellings, horticultural buildings, etc.

Hot-water Plate, a deep, metal-covered plate, filled with boiling water, to keep victuals warm.

Houguette, the etching-needle of the marble-worker.

Houille, the French name for pit coal.

Hounds, projections at the mast-head of a ship, on which the tops or trestle trees rest. — Side bars applied to certain portions of the running-gears of a carriage to give them strength.

Houppelande [Fr.], a riding-coat.

Hour, a division of time; the 24th part of the day.

Hour-Glass. See SAND-GLASS.

Hour-Hand, the short index-hand of a clock or watch; that which points to the hour, while the long hand indicates the minutes.

Housatonic R.R. runs from Bridgeport, Conn., to State line, Mass., 74 m., and operates under lease the following lines: The Berkshire R.R., from Conn. State line to West Stockbridge, Mass., 22 m.; the West Stockbridge R.R., from West Stockbridge to New York State line, 2.75 m.; the Stockbridge and Pittsfield R. R., from Vandeusenville to Pittsfield, Mass., 22 m; and the New York, Housatonic, and Northern R. R., from Brookfield Junction to Danbury, Conn., 5.50 m., making a total of 126.25 m. of road operated. This Co., whose offices are in Bridgeport, Conn., was chartered in 1836; the road was opened in 1842. *Financial statement:* Cap. stock, common, $820,000; preferred 8 %, $1,180,000; funded debt, 1st mortgage 7 % bonds, issued 1865, $100,000, payable 1885; 2d mortgage 6 % bonds, issued 1869, $300,000, payable 1889.

House, a place of residence; a building of various forms, styles, and dimensions, occupied by dwellings. — A sea term, implying to protect or secure anything, as housing a gun, mast, etc. — A term for a business firm; a commercial establishment; a mercantile or business concern; as, the house of Taylor and Taylor.

House-Agent, a person intrusted with the letting of houses or apartments, estates, etc.

House-Breaking, entering a house for unlawful purposes in the daytime; a felonious entry at night is termed burglary.

House-Decorator, one who combines the business of several trades, painting, paper-hanging, whitewashing, etc.

House-Dog, a terrier, mastiff, or some other dog kept chained up for the protection of a dwelling.

House-Factor, an agent in Scotland for the sale or letting of houses.

House-Flag, the distinguishing flag of a particular owner or firm, generally carried on the main-mast of the ship.

House-furnishing Goods, a general trade name for a countless variety of household articles, such as brooms, brushes, cooking utensils, cutlery, hollow-ware, iron and wooden wares, etc.

Householder, the occupier and renter of a house.

Households, a technical name among English millers for the best flour made from red wheat, with a small portion of white wheat mixed.

House-Joiner, a carpenter who does work for the interior of houses.

House-Keeper, the head woman-servant or manager of a household; one who has the charge of the ménage.

Housemaid, an indoor domestic, one who attends table, and has the care of the furniture, rooms, etc.

Housewife, a kind of needle-book, or case, for holding thread, needles, buttons, etc., often taken to sea by sailors.

Housing, a covering or protection to anything, as to a vessel laid up in harbor or dock. — A small cord used at sea, made of three small yarns, and used for seizings; also termed house-line.

Houston and Texas Central R.R. runs from Houston to Red River City, Texas, 345 m.; with branches from Hempstead to Austin, 118.75 m., and from Bremond to Ross, 58 m., making a total of 521.75 m. owned. This Co., whose offices are in Houston, was chartered in 1848 and the road opened in 1873. It has a land-grant of 16 sections from the State of Texas for every mile of road built and equipped. *Financial statement:* Cap. stock, $7,722,900; funded debt, $14,586,500; school-fund loan (State of Texas), $315,494.86. The lands granted amount to 5,240,000 acres, estimated value $1 per acre. Funded debt in detail: 1st mortgage main line bonds, issued 1866, $6,262,000, payable 1891, interest 7 % (June and July); 1st mortgage bonds, western division, issued 1870, $2,270,000, payable 1891, interest 7 % (June and July); 1st mortgage bonds, Waco and North Western, issued 1873, $969,000, payable 1903, interest 7 % (June and July); consolidated mortgage, issued 1872, $3,642,000, payable 1902, interest 8 % (August and Oct.); consolidated mortgage, W. & N. W., issued 1875, $84,000, payable 1915, interest 8 % (May and Nov.); income and indemnity bonds, issued 1877, $1,359,500, payable 1917, interest 7 % (May and Nov.). The school-fund loan bears 6 % interest with a sinking-fund of 2 %, and is secured by $570,000 bonds reserved by the trustees.

Howard, a fire-insurance Co. located in New York City, organized in 1825. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $500,000; net surplus, $133,943.07. Risks in force, $23,844,854; premiums, $201,075.77. Premiums received since March, 1836, $6,416,894; losses paid since March, 1836, $4,314,819; cash dividends paid to stockholders, $,2,005,875.

Howdah, the body of an Indian carriage; a small pavilion or car, with trappings, on the back of an elephant.

Howdy, in Scotland, a midwife.

Howitzer, a kind of gun, from which large shot and shell may be thrown at short ranges. These guns are constructed in brass and iron. Brass *H.* form part of a field-battery, and are used for firing shell to clear a village, or any similar position that it is necessary to occupy. They vary in length from 2 feet to 4 feet 9 inches, and will throw 4⅖ inch and 5½ inch shells. Iron *H.*, from 4 to 5 feet in length, which throw 8-inch and 10-inch shells, are used in sieges, especially for ricochet firing. *H.* are longer than mortars, and shorter than guns of the same calibre; they require a small charge of powder, but the angle of elevation at which they are fired is high.

Howker, a two-masted Dutch vessel; a kind

of hulk; also a small fishing-smack, used on the Irish coasts.

Hoy, a small passenger sloop employed on the sea-coast, or in conveying cargo from a ship in a roadstead or bay.

H. P., the abbreviation for "horse-power" and "half-pay."

Hub, a fluted screw of hardened steel, adapted to be placed on a mandrel between the centres of a lathe, notched to present cutting edges, and to be used in cutting screw-tools, chasing-tools, etc. — In die-sinking, a cylindrical piece of steel on which the design for a coin is engraved in relief. *E. H. Knight.* — In carriage-making, a nave.

Huanaco Bark. See CINCHONA.

Hubble-Bubble, the bottom of a hookah, or snake-pipe.

Hubla, a weight for pearls and diamonds, used in Sinde; about 2 grains troy.

Huckaback, a species of very coarse diaper, made of flax, used for towelling, table linen, etc.

Huckster, an inferior dealer or minor trader; a hawker or itinerant vender of goods with a pack, box, or tray.

Hudson, a river of the State of New York, and one of the most important in the United States. It rises in the Adirondack mountains by two branches which, after a separate course of about 40 m., unite in Warren County. After a S. course of 15 m. the H. receives the Sacandaga, on the line between Montgomery and Saratoga Counties. It then runs for 15 m. S. E. to Hadley Falls, and for 20 m. N. E. to Glen's Falls. Its direction is then nearly S. to its entrance in New York Bay. It receives from the W., 40 m. below Glen's Falls, and 170 m. from its mouth, it greatest tributary, the Mohawk. The length of the *H.*, from its entrance into New York Bay, is a little over 300 m. So straight is this river between Albany and New York, that the distance is less by water than by land. The tide flows to a little above Albany. It is navigable for the largest ships 118 m., to Hudson, and for sloops and large steamboats, 145 m. above New York, to Albany. Small sloops also proceed to Troy, and through the dam and lock to Waterford, about 8 m. further. Through a considerable part of its course the banks are elevated, and in some parts high, rocky, and precipitous; particularly in its passage through the Highlands, 53 miles above the city of New York. The scenery on the banks of the Hudson is highly picturesque. The city of New York owes much of its prosperity, and its pre-eminent advantages, to this noble river, which is unrivalled as a navigable medium of commerce. It is connected by the Erie Canal with the Great Lakes, by the Champlain Canal with the St. Lawrence River, and by the Delaware and Hudson Canal with the Delaware River and the Pennsylvania coal region. By no other route can an equally favorable water communication be had with the great West. There are many large and flourishing towns on the *H.* The principal on the east side are Troy, Hudson, Poughkeepsie, Peekskill, Sing Sing, Tarrytown, Yonkers, and New York; and on the west side, Waterford, West Troy, Albany, Catskill, Kingston, Rondout, Newburgh, Haverstraw, Nyack, Piermont, Hoboken, and Jersey City. The largest tributaries of the *H.*, beside the Mohawk, are the Hoosac, Walkil, and Croton. Spuyten Duyvil creek connects it with the Harlem River, which flows into the East River, forming the N. boundary of Manhattan Island.

Hué. See COCHIN CHINA.

Huffling, a process of ornamenting gilded leather.

Huile, the French name for oil.

Huissier, an usher or door-keeper in a French court; a public officer, a process-server, whose duty it is to draw up and deliver, at the residence of parties concerned, official legal documents, etc.

Huitre, the French name for oyster.

Hujaum, an East Indian barber.

Hulk, the hull of an old vessel, employed in harbors for various purposes.

Hull, the body of a ship, exclusive of the masts, rigging, etc. *Hull down* expresses that the hull of the ship is concealed by the convexity of the sea.

Hull. See GREAT BRITAIN (Seaports).

Hulling, the process of cleaning grass-seeds and cereal grains.

Human Hair. See HAIR.

Hummeler, an instrument for clearing barley of the haums or avels.

Humming-Top, a hollow spinning-top. — A child's toy.

Humulin, the name given to a beautiful extract or essence of hops, made as follows: —

A concentrated tincture of hops is prepared by percolation with rectified spirit; the same hops are then exhausted with water; the spirit is removed from the tincture by careful distillation, and the upper aqueous portion is skimmed off, and added to the infusion, which latter is then evaporated to the consistence of a soft extract; the oleo-resinous residuum of the tincture is next added, and well mixed in; after which the whole is put into pots and carefully tied over for sale. The product possesses all the fragrant, tonic, and bitter qualities of the hop in a highly condensed form. See HOP.

Hundred, in numeration, twice fifty; but in commerce, a variable amount of different goods. Though in Great Britain, as in America, the legal hundred-weight be 112 lbs., the English hundred for sugar is 108 lbs.; for wool, 110 lbs.; for iron, 120 lbs. In Maryland, the hundred is 100 lbs. In Belgium, the hundred of articles sold at market is invariably 104 pieces. The hundred of planks or deals in Sweden is 120, in Westwyck 124, in Christiana 127, and in some other northern European ports, 132 (see GREAT HUNDRED). — A division or part of a county in England and in the State of Delaware.

Hundred-Weight, the chief measure of weight for bulky articles, containing 112 lbs. avoirdupois; the 20th part of a ton. It is generally written, for shortness' sake, *cwt.* (See CWT.)

Hungary. See AUSTRIA-HUNGARY.

Hungary-Water, Queen of Hungary's Water, an old-fashioned but delicious perfume for the toilet, distilled with water and spirits of wine from the tops of rosemary flowers.

Hungary Wines have long enjoyed a well-merited fame. The varieties of these wines which are capable of being rendered fit for exportation are few, but these few rank so high in the highest class of the products of the vintage, that they have borne the name of Hungarian Wine far beyond where it has ever been tasted or seen. The vineyards which produce the best wines are those of Ofen, Pesth, Tokay, the Syrmia in the South, Groswarden, Erlon, and Warwitz in the Bannat. The consumption in the country is very considerable, amounting to about 350,000,000 gallons, while the exports scarcely reach 35,000,000 gallons.

The manufacture of the wine is very coarsely carried on by the peasantry, who are, notwithstanding their want of care and system, very observant of cleanliness in all that concerns the vintage. The wine-presses and vats are well cleaned with boiling water in which vine leaves have been steeped. The fruit is collected in wooden vessels, which are carried by the laborers, and overseer sattend to see that no grapes are left on the vines. The different gatherings are collected in vats having a double

bottom, the uppermost of which is pierced with holes for the juice to pass through, while the grapes are beaten and bruised with a stick. When the upper vessel is full, its contents are taken to the press. They generally divide the gathering for the red and white wines, but do not reject the bad grapes. All are pressed together, and the must thrown into a large vat to ferment. When the grapes are too abundant for the operation of pressing, they put them into sacks and tread them out, and the contents of the sack are afterwards put by for distillation. About 30 kinds of *H. W.* have been reckoned The most celebrated is the *Tokay*, the product of a district around the town of that name, extending about 20 m., called the Submontine or Hegyalla, in High Hungary. The grapes for this wine, which are large, and of a rich, luscious taste, are the Hungarian Blue, when ripe called Trockenbeeren. They are collected late in the season when already almost shrivelled up to raisins, and are carefully picked one and one. The species called *Formint* and *Hars-Sevelu* furnish the prime Tokay, called Tokay Ausbruch. The Trockenbeeren are over-ripe in October, and are carefully placed on a grooved table, from which the juice runs into earthen jars, and forms the rich "essence of Tokay," from their own pressure. This wine is like the sirups of the South of France, and is set aside by itself. The quantity made is small and very thick, and is considered most precious. The grapes are then trodden in a vat with the naked feet, and a small portion of wine essence is added to the must, which is allowed to stand 24 hours, and then set to ferment. This last is the famous Tokay wine, or Tokay Ausbruch (*ausbruch*, or flowing forth of the sirup). It ferments for two or three days or more, during which it is stirred, and the matters which arise to the surface are skimmed off. It is then strained into casks. Tokay has a powerful aroma. It does not become bright for some time after it is in the cask Tokay Ausbruch contains 61 parts of essence and 84 of wine. The Maslas is a more diluted species of the Tokay, containing 61 parts of essence and 169 of wine. The best wine of Tokay has so peculiar a flavor of the aromatic kind, and is so luscious, that the taste is not easily forgotten. This wine sells in Vienna for about $4 the small Tokay bottle, and much dearer when 40 or 50 years old. The vineyard belongs to the Emperor and certain of the nobles; that called Taiczal produces the best. The side of the slope on which the vineyards lie is about 9,000 yards long; but the choice portion, called Mezes-Malè, is but 600, and is reserved with its produce for the Emperor and a few of the nobles. Tokay and Mada come next The vineyard of Tallya is reputed to have most body, and that of Zambor the greatest strength. The wines from Szeghi and Tsadany are the most aromatic, while the wines of Tolesva and Erdo Benye are best for exportation. Tokay cannot be drank under three years old. The wine ferments in the casks on transportation by sea, and thus clarifies itself In bottling, a space must be left between the cork and the wine, or the bottle will break. In Hungary a little oil is poured upon the wine, it is then corked, and a piece of bladder tied firmly over the cork. At Cracau this wine has been kept of the hundredth vintage. The new is called there *vino slotki*; the old, *vino vitrawno*. The color of the prime Tokay should not be of a reddish hue, though there is an inferior sort of that color; the taste soft, and not sharp or acrimonious, it should appear oily in the glass, and have an astringent twang, a little earthy. The aroma, however, cannot be mistaken, as that of no other wine resembles it. The wine of *Buda* is red, and was once a favorite in England. The *Sexard* resembles Bordeaux, and the *Groswarden* wine is of excellent body. The red *Menesar* wine is very good, and with Menes-Tokay is grown upon a range of hills of clay slate, so called from the village of Menes. The Tokay essence is enormously dear, and even in Vienna is rarely to be tasted at the tables of the opulent. The practice of mingling the essence with the common wines has given the latter a celebrity which they scarcely deserve, and lessened the quantity of the essence sold. These wines have a harsh taste, which is highly esteemed in some parts of the Continent. The genuine Tokay is commonly exported in wood, but frequently in bottle. The bottles do not contain more than a pint and a quarter. The value of Tokay is another example of the caprice of taste or fashion in wine. The rich muscadine of Syracuse or the lagrima of Malaga seem in every respect equal to it in richness; though the peculiar flavor in the wine of Tokay will easily distinguish it from them, yet that flavor itself has nothing more than its singularity to recommend it. Few Americans would prefer Tokay to wines very much its inferior in fame, did they dare to contradict the decision of fashion in its favor. The vine is also largely cultivated in Austria, the average yield being estimated at about 300,000,000 gallons, including some very good wines, and many more of a very poor quality. In Austria Proper the best are grown in the neighborhood of Lichtenstein. They are stronger than Rhine wines, are of a greenish hue, and may be drank young. The best wine next to the Hungarian is made in Transylvania. An Ausbruch, resembling Tokay, is grown there; and some very good wines are made near Birthalmen. In the Tyrol and vicinity of Trent much common wine is made of excellent quality; but it is all consumed in the country. In Carynthia wines resembling those of Italy are produced, particularly near Moettling and Wipach The Luttenberg wines of Lower Styria are among the first in Germany; those of Sansal and Wiesel are much extolled In Istria good wine is also made. Prosecco, Antignana, St Serf, and Trieste produce red, white, and *mousseux* wines, well flavored Berchetz is a wine grown on a rock in the Adriatic, sweet, and of a deep red color *Vins de liqueur* are made at Capo d'Istria, Pirano, and Citta Nova, called St Patronio Piccoli, Petit Tokai, and St. Thomas are very excellent wines of their class. Syrmia and Posega, in Sclavonia, produce red and white wines of good flavor and strength The neighborhood of Carlowitz is noted for its red wine. The wines of Croatia are made best at Mosyvina, and resemble Burgundy In Dalmatia they make a wine at Sibenico, called Maraschino, whence the name of the liqueur Maraschino di Zara in the same territory. In Moldavia the best reputed vineyards are near Cotnar. The wine of that name is green, and becomes deeper by age. It is nearly as spirituous as brandy, and by many is preferred to Tokay.

Hunter, a pursuer of wild animals for sport or sustenance; also a strong heavy horse suited for the chase.

Hunting-Boots, long boots with white tops.

Hunting-Coat, a scarlet or green coat, or some particular costume worn by a company of hunters.

Hunting-Cog, in machinery, one more cog in the larger of two geared-wheels than would be required to establish an exact relative ratio between the number of cogs in this wheel and that in the smaller.

Hunting-Horn, a bugle; a horn used to cheer the hounds in pursuit of game. — Also, a musical wind-instrument of a circular form, made of metal, and belonging to the horn series. See HORN.

Hurdle, a movable wooden frame of split timber or wattled osiers. — Also an iron fence for protecting trees, enclosing land, or folding cattle and sheep.

Hurds, the refuse of flax; any waste tow or oakum.

Hurdy-Gurdy, a stringed musical instrument, whose sounds are produced by the friction of a wheel and regulated by the fingers. It is only suited to simple music, and was used for such as had many repetitions. Its simplicity and cheapness rendered it, at one time, a favorite instrument among the peasantry of Europe. The instrument is now mostly to be seen in the hands of Savoyard boys, who play it on the streets.

Huron (Lake), one of the five great lakes of N. America, lies between Lake Superior on the N. W., Lake Michigan on the W., and Lake Erie and Lake Ontario on the S. and S. E. Its shape is so irregular that it is difficult accurately to determine its exact dimensions. Its length from N. to S. is 260 m., and 160 m. in breadth from E. to W., in its widest part, but exclusive of the bay on the N. E., it is only 90, and its circumference 1,100 m. Its principal indentations are Saginaw Bay, extending into Michigan, and two others; one immediately N. of Manitou Islands, and the other S. E. of them. The latter, called Georgian Bay, is about 170 m. long by 70 broad, — almost a separate sheet of water, divided from *H.* by a nearly continuous series of islands which are closely connected by the great peninsula of Cabot's Head, and with Point de Tour, the easternmost cape of northern Michigan. Manitou Island is the largest of the group, and Drummond Island separates another sheet of water from the main lake, 80 m. long and 20 broad. The boundary between the U. States and Canada passes along the middle of the main Huron 225 miles, and between Lesser Manitou and Drummond Islands, by what is called the Middle Passage, and curves round to the N. and W. 25 m., to the entrance of St. Mary's River. The elevation of the surface of Lake *H.* above the surface of the ocean is 574 feet, or less than that of Lake Superior by 53 feet, or than that of Lake Michigan by 4 feet. Lake *H.* receives no river worthy of

mention. Its banks are mostly low, especially along its S. and W. sides. Few towns of consequence exist on its shores, and its navigation is rendered dangerous by sudden and violent tempests. Its greatest depth toward its W. shore is at least 1,000 feet, and its mean depth 900 feet, or about 300 feet below the level of the Atlantic.

Hurries, timber stages having spouts by which coals are shot into vessels.

Hurse-Skin, a name for the hard, tuberculated skin of a fish, from which shagreen is made, to cover lancet-cases, pocket-books, sword-hilts, etc.

Hurricane, a violent storm, generally accompanied with thunder and lightning, and distinguished from every other kind of tempest by the vehemence of the wind and the sudden changes to which it is subject. *H.* prevail chiefly in the East and West Indies, Mauritius, and in some parts of China.

Husbandage, the agent or managing owner's allowance or commission for attending to a ship's business.

Husbandman, an agriculturist; a farmer.

Husk, the shell, or external covering of certain fruits or seeds of plants; the rind; the bark; especially the ears of Indian corn.

Hussy, Huswife. Same as HOUSEWIFE.

Hutch, a box or cistern. — A cage for tame rabbits. — A basket in which coals are brought from the mines. — A measure of two bushels; six hutches of coal make a cartload of about 14 cwt.

Hyacinth, a bulbous plant, genus *Hyacinthus*. There are numerous and very beautiful varieties cultivated in gardens. The bulbs are largely imported from Holland, and are often grown in water contained in suitable glass vessels (hyacinth glasses). — The term is also applied to crystallized varieties of ziscon, a valuable gem of various shades of red, passing into orange and poppy red.

Hydragogues are medicines which cause the removal of water from any of the cavities of the body. Many cathartics, as gamboge, jalap, etc., are classed under this head.

Hyalotype, a photographic positive on glass.

Hydrant, a water-plug; a pipe or spout for discharging water at a fire.

Hydra-Pult, a force-pump on a portable scale.

Hydrate, a chemical combination of water with other substances, as hydrate of chloral.

Hydraulic Cement, Water-Lime, the name given to a class of cements which have the power of hardening under water. See CEMENT.

Hydraulic Engineering, that branch of engineering which treats of the appliance of water as a motive-power for mechanical purposes, and the methods that must be adopted to offer an effective resistance to the pressure which is exercised by any great volume of that fluid, whether it be in a state of rest or in motion.

Hydraulic Motor, a water-engine.

Hydraulic Press. See HYDROSTATIC PRESS.

Hydraulic Ram, a kind of force-pump originally invented by Montgolfier, for raising small quantities of water, by employing its own momentum, to heights considerably above the source of supply.

Hydraulic Wheel. See WATER-WHEEL.

Hydrocarbon, a compound of carbon and hydrogen. The hydrocarbons constitute a most important series of organic compounds.

Hydrochloric Acid is a colorless gas, very acid to the taste and irritating to the eyes; it induces coughing even if breathed in small quantities, or when largely diluted, and is very destructive to vegetation. It has a sp. gr. of 1.261. When subjected to a pressure of 40 atmospheres at 50° F., it becomes a colorless fluid capable of dissolving bitumen, and having a sp. gr. of 1.27. It has never been frozen. *H. A.* neither burns nor supports combustion. The white fumes which it forms when exposed to the air are due to its condensing the atmospheric moisture, and thus giving rise to a body less volatile than water. This gas is greedily and instantly absorbed by water. A fragment of ice placed in a jar of the gas absorbs it, and becomes immediately dissolved. Commercial *H. A.* is usually of a yellow color, owing to its being contaminated with iron. It also very frequently contains sodium, arsenic, sulphuric and sulphurous acids, and free chlorine. Pure aqueous solution of *H. A.* should leave no residue upon evaporation; it should give no precipitation of ferric oxide when saturated with ammonia; sulphuretted hydrogen should cause no turbidity in it; if diluted with three or four times its volume of water, and chloride of barium be added, no white cloud or precipitate should form in the mixture; nor should the acid, if pure, discolor a fluid made faintly blue with iodide of starch. *H. A.* is largely consumed in the manufacture of chlorine, sal ammoniac, chloride antimony, glue, phosphorus, in the preparation of carbonic acid for the manufacture of artificial mineral waters, in beet-root sugar-works, hydrometallurgy, and alone, or mixed with nitric acid, for dissolving various metals.

Hydrocyanic Acid, Prussic Acid, a colorless liquid, having a sp. gr. of 0.7058 at 44.6° F. It is very inflammable, burning with a violet flame resembling that of cyanogen, but somewhat whiter in color. It is soluble in all proportions in water, the resulting mixture being lighter than that fluid, and miscible with alcohol. It is very feebly acid; potassic cyanide always having an alkaline reaction. Red oxide of mercury is readily dissolved by it, and when added to a solution of argentic nitrate it precipitates white flocculi of cyanide of silver. Anhydrous *H. A.* is an extremely volatile liquid; if a drop be let fall on a glass plate, part of it becomes frozen by the cold produced by its own evaporation. It is found in water distilled from kernels of the apricot, the peach, the plum, the cherry, the leaves of the laurel, and some other shrubs. The kernels of the bitter almond also yield it by distillation, mixed with an essential oil. The juice of the tapioca plant likewise contains it. Many nitrogenous substances, when submitted to destructive distillation, also evolve *H. A.* The observance of the greatest care and caution are necessary in the preparation and handling of this most potent poison.

Hydro Extractor, the name given to a machine acted by centrifugal force, and used for wringing and drying clothes.

Hydrogen, a most important elementary body discovered by Cavendish in 1766. Combined with oxygen it constitutes water, and in this form is extensively distributed through earth, air, and ocean. It is an important constituent of all organized tissues. It is always obtained for experimental purposes by the deoxidation of water. *H.* is gaseous, colorless, tasteless, odorless (when pure), combustible. Sp. gr. .06935, being 16 times lighter than oxygen gas, and 14.4 times lighter than atmospheric air. 100 cubic inches, at 60° F. and 30 inches of the barometer, weigh 2.1371 (say 2.14) gr.; 1 gr. occupies 46.6 inches. It is very readily inflamed, even by a red-hot wire. It burns with a scarcely visible flame. Mixed with atmospheric air or oxygen, it explodes with extreme violence

on the approach of flame, or sudden compression. One measure of *H.* and 5 of atmospheric air, and 2 of *H.* and 1 of oxygen, are the proportions that explode with the greatest violence. The combination of *H.* and oxygen, when mixed, is brought about by the heat of a red-hot solid or a flame, by the electric spark, and by the presence of spongy platinum, the black powder of platinum, clean platinum foil, and some other substances. A jet of *H.* burnt in oxygen gas, or a jet of these gases (mixed) burnt in the air, with proper precautions, produces a most intense heat. *H.* has recently been liquefied and even solidified. It is recognized by its combustibility, the pale color of its flame, producing water only when burnt in air or oxygen, extinguishing the flame of other bodies, and exploding when mixed with half its volume of oxygen, and fired. — Pure and uncombined *H.* is not employed in the arts. Inhalations of this gas have, however, been occasionally used in medicine. In combination, the uses of *H.* are almost numberless. Combined with oxygen, it forms water; with chlorine, hydrochloric acid; with fluorine, hydrofluoric acid; with cyanogen, hydrocyanic acid; with carbon, innumerable hydrocarbons; with nitrogen, ammonia; with sulphur, sulphuretted hydrogen, — in fact, an enumeration of the valuable compounds which it enters into would occupy many pages of this work. From its extreme lightness it has been used to fill balloons, but coal-gas is now commonly employed for this purpose. The chemist avails himself of the great heat developed by its combustion in oxygen in the formation of the *oxyhydrogen blowpipe.*

Carburetted H. This term is specially applied to two of the numerous compounds of carbon and *H* : 1. *Light carburetted H.*, *Fire-Damp*, or *Marsh-Gas*, is a colorless, neutral, nearly inodorous gas. It burns with a yellow flame, producing pure water and carbonic acid. It explodes when kindled in contact with air or oxygen. (See FIRE-DAMP.) 2. *Heavy carburetted H.* (See OLEFIANT GAS.) — *Coal Gas*, *Oil Gas*, and *Resin Gas*, consist, for the most part, of mixtures of these two gaseous hydrocarbons in uncertain proportions, respectively from coal, oil, and resin, by the action of heat, and are used for the purposes of illumination. See GAS.

Peroxide of H., *Oxygenated Water*, is a colorless, transparent, somewhat sirupy liquid, of sp. gr. 1.452. It has a metallic taste, and corrodes the skin. It is easily resolved into oxygen and water. It mixes freely with water, and becomes more permanent by the dilution. It bleaches organic substances, and acts as a powerful oxidating agent. Under certain circumstances, however, it plays the part of a reducing agent. Peroxide of hydrogen has been applied in the arts to restore the blackened lights of paintings which have become darkened by sulphuretted *H.*; it is also sold by hair-dressers for bleaching human hair.

Hydrographical Charts or **Maps**, usually called sea-charts, are projections of some part of the sea or coast for the use of navigation. In these are laid down all the rhumbs, or points of the compass, the meridians, parallels, etc., with the coasts, capes, islands, rocks, shoals, shallows, etc., in their proper places and proportions.

Hydrography, the art of measuring and describing the sea, rivers, canals, lakes, and the like. With regard to the sea, it gives an account of its tides, counter-tides, soundings, bays, gulfs, creeks, and also of the rocks, shelves, sands, shallows, promontories, and harbors; the distance and bearing of one port from another, with everything that is remarkable, whether out at sea or on the coast.

Hydromel, an aqueous solution of honey; a refreshing and slightly laxative drink.

Hydrometer, Areometer, an instrument for ascertaining the specific gravities of liquids, and hence their strength, the latter being either in inverse or direct proportion to the former. *H.* are of two kinds: 1st, those which are always immersed to the same depth in distilled water and the liquid to be tried, small weights being used for the purpose, as in Fahrenheit's and Nicholson's *H.*; 2d, those which are suffered to rise or sink freely in the liquid, until they come to a state of rest, as in Baumé's, Syke's, etc. In both cases a correction must be made for any variation in temperature. Of the two kinds, the first give the most accurate results, and have the great advantage of being applicable to liquids either lighter or heavier than water, but the second are the readier in practice, requiring less time and less skill to use them. The following are those best known: —

Baumé's H., which is generally employed on the Continent of Europe and recognized in the U. States, consists of two distinct instruments, the one for liquids heavier than water, the other for liquids lighter than that fluid. The first floats at the 0, or "zero," of the scale in distilled water, at the temperature of 58° F., and each degree, marked downwards, indicates a density corresponding to 1 per cent of common salt. The *H.* for liquids lighter than water is poised so that the 0 of the scale is at the bottom of the stem when it is floating in a solution of 1 oz. of common salt in 9 oz. of water, and the depth to which it sinks in distilled water shows 10°; the space between these fixed points being equally divided, and the graduation continued upwards to the top of the scale. The temperature at which these instruments were originally adjusted by Baumé was 12.5° Centigrade (54.5° F.). They are now commonly adjusted in England at 58° or 60° F. Hence arise the discrepancies frequently observable in the published tables of the "correspondence between degrees of Baumé and real specific gravities."

Cartier's H., which is much used in France for light liquids, has the same point for the zero of its scale as Baumé's, but its degrees are rather smaller, 30° Baumé being equal to 32° Cartier.

Fahrenheit's H. (Fig. 278) consists of a hollow ball, with a counterpoise below, and a very slender stem above, terminating in a small dish. The middle or half-length of the stem is distinguished by a fine line across it. In this instrument every division of the stem is rejected, and it is immersed in all experiments to the middle of the stem by placing proper weights in the little dish above. Then, as the part immersed is constantly of the same magnitude, and the whole weight of the *H.* is known, this last weight, added to the weights in the dish, will be equal to the weight of fluid displaced by the instrument; and, accordingly, the specific gravities for the common form of the tables will be had by the proportion: *As the whole weight of the hydrometer and its load, when adjusted in distilled water, is to the number* 1000, *so is the whole weight when adjusted in any other fluid, to the number expressing its specific gravity.*

Fig. 278. — FAHRENHEIT'S HYDROMETER.

Gay-Lussac's alcoholometer is used to determine the strength of spirituous liquors. It at once indicates on the stem the percentage of absolute alcohol in the liquid examined. The original experiments of Gay-Lussac having been made on liquids at a temperature of 59° F., all examples examined by the alcoholometer must either be brought to that temperature previous to being tested, or a correction made in the strength found.

Nicholson's H. is constructed on the same principle as Fahrenheit's. It has in addition to the small dish for weights above, a little cup attached below, for holding any solid body whose weight in water is required. It is chiefly intended for taking the sp. gr. of minerals.

Richter's H. resembles, for the most part, Gay-Lussac's.

Syke's H. consists of a thin, flat stem, about six inches in length, divided on both sides into eleven equal parts, each of which is again subdivided into two. This stem carries a hollow brass ball, about one inch and a half in diameter, in which is fixed a conical stalk terminating in a pear-shaped weight, so that when the instrument is placed in a fluid, it may float with the other extremity perpendicular to the surface. Ten different weights of different magnitudes are also applicable to the lower portion of the graduated stem. Nine of these weights are circular, with a slit in each to fit the stem, and are numbered respectively 10, 20, 30, 40, 50, 60, 70, 80, and 90. By the successive application of these the instrument may be sunk so as to obtain the whole range of specific gravities, from pure alcohol to distilled water. The tenth weight is in the form of a parallelopiped, and can be fixed, when necessary, to the upper part of the stem. In order to calculate the strength

of a portion of spirit by this *H.*, a portion of the liquid is placed in a tall glass vessel, and the temperature noted by means of the thermometer. The instrument is then floated, and one or more of the weights is added, until the lower part of the scale sinks beneath the surface. The number on the stem in contact with the surface is then observed, and added to the number of the circular weight employed; and this third number is referred to a series of tables calculated for the purpose, and usually sold with the instrument. In these tables, under the proper temperature, will be found the percentage of strength required.

Tralle's H. resembles Gay-Lussac's (nearly).

Twaddell's H. is much used in bleaching establishments. According to this scale, 0 is equal to 1000 or the sp. gr. of distilled water, and each degree is equal to .005; so that, by multiplying this number by the number of degrees marked on the scale, and adding 1, the real sp. gr. is obtained.

Alcoholometers, saccharometers, urinometers, etc., are simply *H.* so weighted and graduated as to adapt them for testing spirits, sirups, urine, etc.

Hydrometrograph, an instrument for measuring the quantity of water discharged in a given time.

Hydrophore, an instrument for obtaining specimens of water from any given depth below the surface.

Hydroscope, a hygrometer.

Hydrostat, a general term for any apparatus or contrivance to prevent the explosion of steam-boilers.

Hydrostatic Balance, a balance for weighing substances in water, for the purpose of ascertaining their specific gravity.

Hydrostatic Press, Hydraulic Press, also called *Bramah's Press*, from the name of the engineer who first devised it under its actual form, is a heavy iron machine worked by water-power, and very advantageously used in many branches of industry.

The *H. P.*, of which there are many different forms, adapted to different uses, is constructed on this principle: that if a close vessel is filled with a liquid that we will suppose to have no weight, and if an aperture of the size of one square inch be made in one side of it and fitted with a piston upon which there is exerted a pressure of 10 lbs., there will also be exerted the same pressure of 10 lbs. upon every square inch of the internal surface of the vessel. Consequently, if another aperture of 100 square inches area is made in the side of the vessel, and a cylinder of the same size is fitted to it, a piston fitted to this will receive a pressure of 1,000 lbs. In the model shown in Fig. 279, P is a reservoir of water on which is a pump, A, the piston-rod, *a*, of which is worked by the hand-lever, O. The water is conveyed by the pipe, *d*, to the cylinder, R, to the piston, C, and table, K, which rises between the guides that hold the upper plate, M N, against which the object under pressure is driven. The force developed is hardly conceivable, frequently testing the strength of the mechanism in a severe way. The power of a *H. P.* depends mainly on the ratio between the diameter of the pump-piston and that of the cylinder-plunger. The largest of these machines ever known were those constructed for raising the Britannia Tubular Bridge at the Menai Straits. One of them had a plunger or ram 20 inches diameter, and the metal of the cylinder 11 inches thick; a 40-horse-power steam-engine was used to work it, and the head of the ram had a lifting power of 900 tons. In the every-day processes of manufacture, the *H. P.* is largely used in oil mills, cloth dressing and packing establishments, bandana print-works, and numerous other mills and manufacturing establishments.

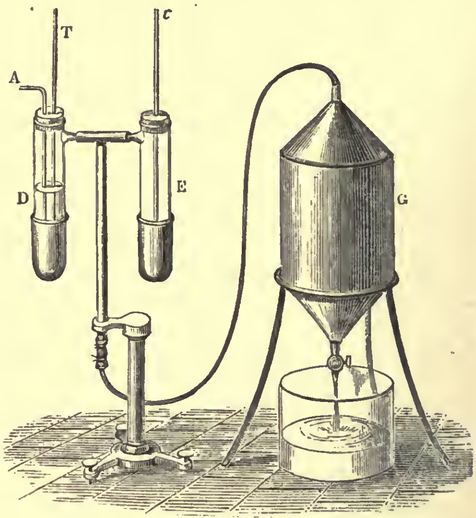

Fig. 280. — Regnault's Hygrometer.

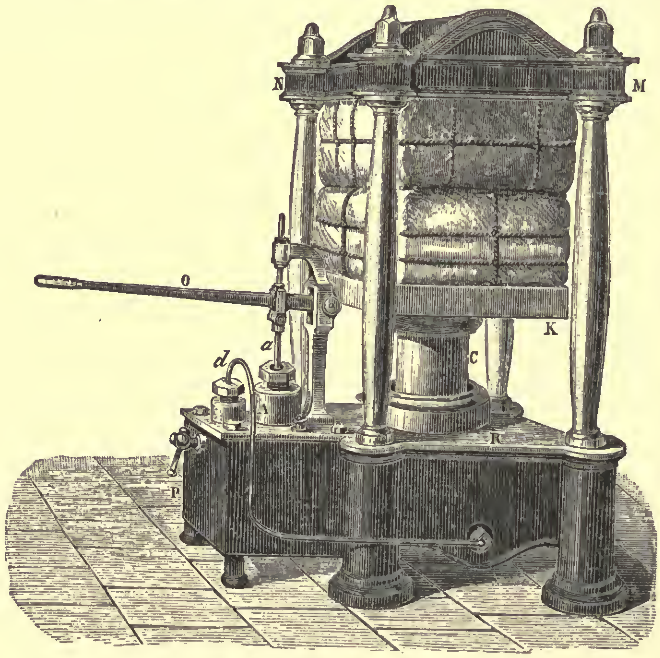

Fig. 279. — Hydrostatic Press.

Hygrometer, an instrument for measuring the amount of moisture in the atmosphere.

Regnault's *H.*, shown in Fig. 280, consists of two thin, polished, silver thimbles, two inches in height and one inch in diameter. In these thimbles are adjusted two glass tubes, D and E, each containing a very sensitive thermometer fixed there with a cork. A tube open on both sides goes through the cork of tube D to the bottom of the thimble. This tube, D, communicates through a lead pipe with an aspirator, G, filled with water. The tube E does not communicate with the aspirator; it contains only a thermometer whose object is to

show the temperature of the air at the time of the experiment This *H.* is worked by filling about half of the tube, D, with ether, and then opening the cock of the aspirator. The water which fills the aspirator empties itself, which causes a partial vacuum in the tube, A. Air is then forced into the tube, A, by atmospheric pressure ; but as that air, to penetrate in the tube, D, and in the aspirator, has to pass through the ether, it vaporizes a part of that liquid, and cools it with a rapidity corresponding to that with which the aspirator discharges its water. The cooling soon determines on the thimble a deposit of dew, and the thermometer, T, giving them the corresponding temperature, it becomes easy to calculate the hygrometric condition of the air.

Hypsometer, an instrument for measuring heights by noting differences in barometric pressures at different altitudes.

Hyson, an esteemed kind of green tea, of which there are several varieties, as hyson-skin, young hyson, etc.

Hysterometer, a surgical knife for operations upon the womb.

I

I, in Roman numeration, stands for one. When placed before another numeral it is subtracted from, and when following is added to, the value of the other numeral; as IX, 9; XI, 11.

Ibis, a genus of birds resembling the storks; the plumage of several is used for ornamental purposes.

Ice is water in a solid state. On being cooled, water gradually contracts until the temperature has fallen to 39° 9′ F., when it begins to expand. At the freezing-point, 32° F., under ordinary conditions, water crystallizes or freezes, and in consequence of the continued expansion, the sp. gr. of ice, as compared with that of water at 39° 9′, is as .94 to 1.00. Ice has the peculiar property of reuniting by the contact of adjoining surfaces after having been broken into fragments; which property is called *regelation*. Colored water and salt water, by freezing, produce colorless and fresh ice, and spirituous liquors part with their alcohol. To effect this purification perfectly, the ice must be formed under circumstances which prevent the accumulation of blebs and air-bubbles, and the entanglement in the ice of any of the unfrozen or ejected liquor; for the foreign matters held previously in solution in the water are in the act of freezing transferred to the portion which remains unfrozen. If the whole of the water becomes a mass of porous ice, the impurities are retained in the pores; but if the freezing takes place slowly and regularly, time is given for the escape of the impurities, and thus the brilliant and perfectly transparent and dense masses of ice which come from the most northern countries yield, when thawed, water almost equal in purity to that which has been distilled, and nearly free from air.

The ice-trade of the U. States was commenced by Mr. Frederic Tudor, of Boston, in 1805. This gentleman, having previously sent agents to the West Indies to procure information, determined to make his first experiment in that region. Finding no one willing to receive so strange an article on shipboard, he was compelled to purchase a vessel, the brig *Favorite*, of about 130 tons, which he loaded with ice from a pond in Saugus, Mass., belonging to his father, and sent to St. Pierre, Martinique. This first enterprise resulted in a loss of about $4,500, but was, nevertheless, followed up until the embargo and war put an end to the foreign trade, at which period it had yielded no profit to its projector. Its operations had been confined to Martinique and Jamaica. After the close of the war in 1814, Mr. Tudor recommenced his operations He obtained the monopoly of the Havana supply in 1815; introduced the trade in Charleston, S. C., in 1817; in Charleston in 1818; in New Orleans in 1820; sent the first cargo of ice to the East Indies in 1833; and to Brazil in 1834. Up to that time Mr Tudor was alone in the trade, but it was soon divided among many parties in the same and other ports. From the Great Lakes also ice is now carried by railroad to the Southern cities, and through the Illinois River ice is sent down the Mississippi. The shipments of ice in Boston have steadily decreased from 146,000 tons in 1856 to 53,180 tons in 1878. Boston, however, still retains the great bulk of the export trade. The total exports from the U. States for the year 1878 were 64.370 tons (of which 48,215 tons for Boston), valued at $227,328, and distributed as follows: —

Brazil	1,600
Danish W. Indies	3.219
French "	2.802
Canada	625
British W. Indies	10.822
" Guiana	3.164
" E. Indies	18,270
Hawaiian Islands	559
Dutch E. Indies	3,175
Cuba	16,081
Porto Rico	752
Uruguay	2,994
Venezuela	307
Total	64,370

New York exports but little ice, being chiefly engaged in procuring an amount sufficient for its enormous supply, which, including Brooklyn, amounts to about 1,000,000 tons, and is increasing at the rate of about 60,000 tons a year. New York city is chiefly supplied with ice from the Hudson River, above Newburgh, and from the small neighboring lakes. The Knickerbocker Ice Co., which engrosses a large proportion of the business, derives its supply from Rockland and Highland lakes. Ice being shipped and used at all seasons, large store-houses are required to preserve it. These store-houses are huge wooden buildings without windows, standing along the edge of the ponds or along the banks of the rivers. Their capacity frequently exceeds 20,000 tons, and two at Rockland Lake, N. Y., hold 40,000 tons each. At first the implements of husbandry only were used in securing ice, but as the trade became more important, other machines and different methods were adopted, and abandoned when better were brought forward, or when the increased magnitude of the business required greater facilities. More ice is now secured in one favorable day than would have supplied the whole trade thirty years ago. Ordinarily, before there has been cold enough to form ice of suitable thickness, snow falls on its surface. If this occurs when the ice is four or more inches in thickness, and the snow not heavy enough to sink the ice, it can be removed by using horses attached to the *snow-scraper*; and under such circumstances this is the method in common use. But if snow falls so heavy as to bring the water above the surface of the ice, it is removed, after it has congealed into snow-ice, with the *ice-plane*, which takes off about two inches deep and 22 inches wide of its surface. This machine is drawn by two horses, and is guided by inserting its "guides" into grooves previously made with the *ice-cutter*. The chips made by it are scraped off in the same manner as dry snow. These preliminary expenses are often very great; frequently, after much expense has been incurred to remove a body of snow or snow-ice, the weather becomes warm and spoils the ice on which so much has been expended. And, on the other hand, if it is not done and the cold continues, there will be little or no increase of thickness to the ice, which is equally a disaster. When ice has been formed of sufficient thickness, and freed from snow and snow-ice, it is reduced to blocks of uniform size, ordinarily 22 inches square, by the ice-cutter. This machine is similar to a carpenter's plough, except that it has a series of cutting chisels, one succeeding another, and deepening the groove. It is drawn by a horse, and cuts at one passage about two inches deep, and if the ice requires to be planed to remove snow-ice, the guides of the "snow-plane" are used in grooves of this depth, but when grooves are required to split from, the "ice-cutter" should be drawn two or three times through each. These grooves should be parallel to each other, and to make them so, the "ice-cutter" has a guide, which is placed in the last groove made. When the grooves in one direction have been made, others at right angles with them are produced in the same manner. After this has been done, one groove at the end is opened, and also the two outside grooves: a wedging-bar is then stricken into the groove next the end one, and at several places along its length, which detaches it easily from the mass; then the same bar is forced, with a slight blow, into the transverse grooves, which reduces the ice to very uniform square blocks. The blocks of ice thus formed are brought to the receiving-doors of the ice-houses (which are built on the immediate borders of the ponds), either by placing them on sleds, or floating in canals cut through the ice. Various modes of elevating the ice are in use; the endless chain, in combination with the inclined plane, has been successfully used, and also the common pile-driving steam-engine; but at present horse-power is more used than any other. The ice is placed in the houses in regular courses, every block exactly covering the next below it. When a vault has been filled, it is immediately covered with wood-shavings and the receiving-doors fitted up, to prevent waste, until the contents are required for shipment abroad or use at home. The weight of ice for shipment is usually determined at the wharves, immediately before being put on shipboard, on scales which have been constructed for the purpose; and this single operation settles the weight to be paid for by the party for whose account the ice is shipped; the amount due for freight on shipboard, for transportation on the railroad, and that which is to be received by the owner of the ice The artificial freezing of water is principally effected by vaporization and expansion, and by liquefaction. The method by liquefaction is performed by freezing mixtures, many of which will bring water into the state of ice even in the hottest weather. The most important freezing mixtures are given in the following table: —

Substances.	Parts by Weight.	Thermometer sinks from	Thermometer sinks to	Degrees of fall.
Snow or powdered ice....	2		−5	
Common salt	1			
Snow...	8	−10	−56	46
Dilute sulphuric acid....	3			
" nitric acid........	3			
Sulphate of soda........	8	+50	0°	50
Hydrochloric acid.......	5			
Sulphate of soda	6	+50	−14	64
Nitrate of ammonia......	5			
Dilute nitric acid........	4			
Phosphate of soda.......	9	+50	−21	71
Nitrate of ammonia......	6			
Dilute nitric acid........	4			
Snow or powdered ice ...	3	+32	−51	83
Potash	4			

Numerous *ice-machines* have been invented to facilitate the action of these mixtures upon water, or produce ice by vaporization. Among the best known are those invented by Masters, Harrison, Siebe, Carré, Kirk, Windhausen, Holden, Giffard, etc. It does not enter into the scope of this work to describe one or other of these machines, which are generally complicated and expensive; and it is enough to say that in every case there is some chemical agent which takes away caloric, or heat, from a vessel of water and thereby converts the water into ice. The usefulness of ice-machines seems to be limited to exceptional cases in a country as the U. States, which possesses every facility for the production and shipping of natural ice, and cheap transportation by railroads and rivers in almost every part of the country. Thirty years ago the hotels and other large consumers in New York paid $20 per ton for their ice. Now, owing to the introduction of machinery, the better understanding of the business, and the competition between rival companies, the price is reduced to four or five dollars to persons who consume large quantities of ice. The rate to families is not considered much above this price, when the waste of cutting into small pieces and cost of carting are taken into account.

Ice-Boat, a boat so constructed as to sail upon ice. Ice-boats are very common in Holland; they go with incredible swiftness, sometimes so quickly as to affect the breath, and are found very useful in conveying goods and passengers across lakes and great rivers. Boats of different sizes are placed in a traverse form upon a 2½ or 3 inch deal board. At the extremity of each end are fixed irons, which turn up in the form of skates. Upon this plank the boat rests, and the two ends serve as outriggers to prevent oversetting, whence ropes are fastened that lead to the head of the mast in the nature of shrouds, and others passed through a block across the bowsprit. The rudder is made somewhat like a hatchet with the head placed downward, which being pressed down cuts the ice, and serves all the purposes of a rudder in the water, by enabling the helmsman to steer.

Ice-Box, Ice-Chest. See REFRIGERATOR.

Ice-Bound, vessels blocked up in the ice.

Ice-Claw, a rope and pair of claws, for grappling ice-blocks.

Ice-Cream Freezer. See FREEZER.

Ice-Crusher, an implement for crushing ice for cooling beverages.

Iceland. See DENMARK.

Iceland-Moss, a lichen (*Cetraria Islandica*) common in the N. of Europe and N. America, which yields a nutritive starchy substance, sometimes employed to make bread and gruel. It may be formed into a paste; and from its possessing demulcent qualities, as well as a bitter principle, it is extensively employed in consumption and other diseases, being regarded as a dietetic as well as therapeutic agent. *Imp.* free.

Iceland-Spar, calcareous spar in transparent crystals, first brought from Iceland. It is much employed in optical experiments, and is sometimes called double-refracting spar.

Ice-Plane, an instrument for smoothing away the rough surface of ice in winter, before cutting and carting it away for storage.

Ice-Plough, an instrument used for cutting grooves in the ice on ponds and lakes, to facilitate the removal of blocks of 1 to 2 cwt., which are stored for summer use.

Ice-Safe, a chamber for cooling water, etc.

Ice-Saw, a long saw, with a heavy weight, attached at the lower end (Fig. 281), for cutting channels in the ice to liberate vessels which have been frozen in.

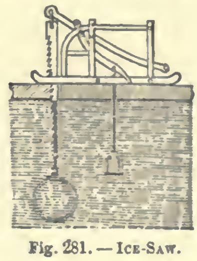

Fig. 281. — ICE-SAW.

Ice-Tongs, utensils for taking up ice at a table.

Icica Resin, resinous exudations of value in the districts of S. America, where the *Icica* trees occur, and furnish the elemi, carana, and tacamahaca resins.

Idaho, a N. Western territory of the U. States, bounded N. by British Columbia, E. by Montana and Wyoming, S. by Utah and Nevada, and W. by Oregon and Washington. It lies between lat. 42° and 49° N., lon. 111° and 167° 10′ W. Extreme length from N. to S., 485 m.; greatest breadth, about 290 m. Area, 86,294 sq. m., or 55,228,160 acres. Pop. about 25,000, exclusive of tribal Indians, who in 1880 numbered about 5 500. The principal towns, each with a very small pop., are Boisé City (the capital), Lewiston, Oregon, Idaho City, Malade City, Pioneer City, and Silver City.

The Snake River, or Lewis Fork of the Columbia River, and its branches drain the entire territory, except a portion about 120 m. long in the extreme N., which is watered by Clark's Fork, the Spokane, and the Kootenay, and a small tract in the S. E. corner, which is intersected by Bear River. Clark's Fork crosses the territory from E. to W., expanding into a lake about 30 m. long and 5 m. wide, near the E. boundary, called Pend d'Oreille. The river and lake are navigable by steamers through Idaho. The surface of Idaho possesses characteristics similar to those of the great inland basin lying further S., being elevated, within the Sierra Nevada and Cascade Mountains on the W., and the Bitter Root and Rocky Mountains on the E., to an altitude of from 2,000 to 5,000 feet above the sea, and having insufficient rainfall for the highest development of vegetation during the summer months without the aid of irrigation. The tendency to aridity, however, is considerably less than in Utah and Nevada, the average range of summer heat in this northern latitude not being so exhaustive of the surface moisture. The many streams intersecting the valleys, having their sources in mountain heights covered with snow during the greater part of the year, also offer unsurpassed advantages for irrigation, and render this one of the most copiously watered of our inland territories. The necessity for irrigation is much less apparent in the N. portion of the territory than further S.; but the extreme cold which often attends the winters of the latitudes approaching the British boundary repels the immigrant agriculturist, and this region consequently contains fewer settlements than the central and southern parts. The mountains of Idaho often attain great altitude, having peaks rising above the line of perpetual snow, their lower slopes being furrowed with numerous streams and alternately clothed with magnificent forests and rich grasses. The plains are elevated table-lands covered with indigenous grasses, constituting pasturage unsurpassed in any section of our country. Among the largest, best situated, and most attractive of the valleys are those of the Clearwater, Salmon, Fayette, Wood, Weiser, St Joseph, and Cœur d'Alène, these being all profusely watered, and possessing soil of extraordinary fertility, readily yielding, with irrigation, abundant crops of barley, wheat, rye, and oats, as well as all the ordinary vegetables and fruits of the temperate zone; while vast stretches of magnificent forest, presenting abundant supplies of timber and firewood, constitute a conspicuous element of beautiful mountain scenery. Bottom-lands of great fertility and considerable extent surround the shores of lakes Cœur d'Alène and Pend d'Oreilles, in the N. part of the Territory; and there are numerous small

but very productive valleys on the streams emptying into those lakes. The preference of agricultural settlers, however, is for the valleys lying within the water-system of the more S. branch of the Columbia. Throughout the spring, summer, and autumn months, in the N. as well as the S. sections, the weather is generally delightful and salubrious; in the winter months the range of the thermometer depends greatly upon the altitude of the surface, the higher mountains being visited by extreme cold, and heavy falls of snow; the lower mountain ranges and the plains having winters generally less severe than those of N. Iowa and Wisconsin or central Minnesota, while greater dryness of the atmosphere renders a lower fall of the thermometer less perceptible; and the valleys being rarely visited by cold weather, high winds, or considerable falls of snow. Considered in its yearly average, the climate is exactly adapted to sheep-growing and the production of wool, the herding of cattle, and the manufacture of dairy products; the raising of very superior breeds of horses, as well as the culture of all northern varieties of fruits, such as apples, pears, plums, cherries, peaches, grapes, and all of the ordinary cereals and vegetables. Besides the great wealth in mines of gold and silver which Idaho contains, constituting the principal attraction to emigrants thus far in the history of the Territory, extensive deposits of not less important useful minerals are known to exist in different sections within its limits, although there has yet been no organized geological survey. Conspicuous among the useful minerals are vast beds of salt, found upon analysis to be almost chemically pure, extensive fields of iron ore, and apparently inexhaustible strata of excellent coal. The coal and salt are already prominent among the mining products; the local demand created by their employment in the process of reducing and refining the ores of gold and silver, as well as by domestic necessity, rendering their production profitable; but increased facilities for transportation to adjacent States and Territories are required to develop these branches of mining industry to a degree commensurate with the great extent and value of the deposits. The first discoveries of gold in paying quantities in Idaho were made in 1860, on the south Fork of Clearwater River. The principal quartz-mines are in the S. W. part, in Owyhee, Idaho, Boisé, and Alturas Counties. Placer diggings occur in various parts of the Territory; the most important are those of Boise basin and along the head-waters of the Salmon and Clearwater rivers. Until 1869 the annual yield of gold and silver ranged from 6 to 8 millions of dollars. Since that time it has been yearly decreasing, the yield for the year 1878 being only $1,150.000 gold, and $200,000 silver. There is a national bank at Boisé City, with a capital of $100,000. No railroads have yet been constructed in Idaho, but as the line of the Union and Central Pacific roads runs in close proximity to its S. boundary, it receives a generous share of the benefits conferred upon this section of the country by the great national inter-oceanic highway. According to the estimate of the commissioner of the U. States general land office, the total area of Idaho is approximately estimated to contain of agricultural lands 16,925,000 acres; grazing, 5,000,000; surface of lakes, 575,000; sterile lands, producing no other vegetation than wild sage and occasional tufts of buffalo-grass, 14,328,160; mountain lands, 18,400,000 — embracing 17,500,000 acres of timber lands, and 8,000,000 of mineral lands.

Illegal, any act contrary to law, such as the use of false weights and measures, smuggling, etc.

Illicit, unlawful, prohibited; as secret distillation, etc.

Illinois, a Western State of the American Union, bounded N. by Wisconsin, N. E. by Lake Michigan, E. by Indiana, S. E. and S. by Kentucky, and W. by Missouri and Iowa. It lies between lat. 36° 39′ and 42° 30′ N., lon. 87° 35′ and 91° 40′ W. Its extreme length from N. to S. is 385 m., extreme breadth from E. to W. 218 m. Area, 55,410 sq. m. This important State is divided into 102 counties. Chicago, its commercial metropolis, is the largest city of the West. The seat of government, Springfield, is a fine city, lying near the geographical centre of the State, in lat. 39° 48′ N., lon. 89° 45′ W.; it has an active trade and important manufactures, with a population of about 30,000. The other principal cities of Illinois are: Alton, pop. 10,000; Aurora, 15,000; Belleville, 10,000; Bloomington, 18,000; Cairo, 7,500; Decatur, 8,000; Elgin, 7,000; Freeport, 9,000; Galena, 9,000; Galesburg, 12,000; Jacksonville, 11,000; Joliet, 9,000; La Salle, 6,000; Ottawa, 9,000; Pekin, 6,500; Peoria, 28,000; Quincy, 40,000; Rockford, 14,000; Rock Island, 9,000. Total population of Illinois, about 3,000,000.

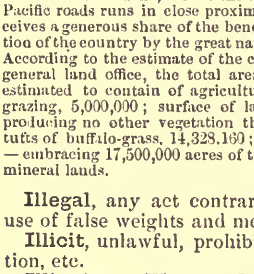

Fig. 282. — Seal of Illinois.

Illinois may be regarded as an extensive table-land, gently inclining toward the S. W. At the mouth of the Ohio the soil is only about 340 feet above tide-water in the Gulf of Mexico, and the highest elevation in the whole State does not exceed 800 feet above that standard. Its surface is occupied almost entirely by prairies, which are popularly distinguished by the names, "wet" and "dry," "alluvial" and "rolling." The wet prairies are peaty, indicating that they were once morasses. Those of an alluvial nature are dry, with a rich black loam, and exceedingly fertile. They are covered with a coarse kind of grass, which grows to an enormous size. The soil of the high and "rolling" prairies is, in general, only of second-rate quality, and abounds in springs. Grape-vines are abundant. The prairies furnish an inexhaustible summer range for cattle. From the exceeding flatness of some of the plains, the rains that fall are allowed to stagnate, and thus render the situation unhealthy. The Grand Prairie, which is the largest tract of this description, is probably the highest table-land between the Mississippi and the Wabash. It extends from the county of Jackson, in a N. E. direction, to the Iroquois county, and varies in breadth from 1 to upward of 12 m. Although passing under one name, it does not consist of one single tract of land, but is broken up into several reaches of prairie ground, with strips of wood running between them. It is rich and fertile, and several settlements have been located on its border, which is everywhere skirted with wood. The prairies, generally, are not plentifully supplied with timber, most of them being only interspersed with groups of trees, or skirted with strips of forest. Much of the young wood is destroyed by the annual winter burning of the coarse grass, which covers at least two thirds of the prairie land. In spring the prairies again become profusely decked with the greatest variety of beautiful and delicate flowers of every hue. Illinois is distant from the sea, but is well provided with rivers. Nearly three fourths of its boundary is formed by navigable rivers; and on the N. E. it has Lake Michigan for upward of 60 m. The Mississippi, which forms its entire western, and the Ohio, which forms the southern boundary, give commercial access to those valleys which bear their names. The Wabash, a noble stream which bounds the State on the E. for more than 100 m., is navigable for more than that distance. For internal communication, the Illinois, which belongs entirely to this State, is navigable at all seasons for steamboats for 260 m. to La Salle, where navigation is stopped occasionally by the little rapids, and where a canal branches off, connecting the river with Lake Michigan. The principal tributaries of the Illinois, which is itself formed by the junction of the Kankakee and the Des Plaines, are the Fox River which rises in Huron Territory, and has a course of 200 m. before it joins the Illinois; the Vermilion River, which falls into it from the S. E.; the Sangamon from the E., the Mackinaw from the N. E., and the Spoon River from the N. W. These are almost all navigable for considerable distances. The Sangamon is navigable for 140 m. The Little Wabash and the Embarrass, which flow into the Wabash, are likewise navigable for upwards of 150 m. The Rock River, which rises in Wisconsin, and falls into the Mississippi, after a course of about 300 m., is navigable for some distance, but its upper course is impeded by rapids. The climate of Illinois, extending as it does over a space of 5½ degrees of latitude, must necessarily be varied. The natural difference of temperature between the N. and the S. parts is, however, increased by the numerous and large rivers which bound and intersect the country, and by its state of cultivation. Everywhere the winters are severe, the summers hot and long, and the temperature subject to frequent and sudden changes. In the S. parts of the State the summer heat is very oppressive and enervating; and is only occasionally relieved by fresh breezes from the prairies. In winter the snow falls to a considerable depth, and lies occasionally for three months; and many of the rivers remain frozen for the same length of time. In some parts of the State only a few inches of snow falls, and it quickly disappears. — Illinois possesses a vast extent of arable land. The soil, although varied, is generally highly productive, and for agriculture, it has been considered as unsurpassed by any State in the American Union. The soil in "the bottoms," or along the river valleys, such as those of the Rock River, the Sangamon, and Kaskaskia, consists chiefly of rich alluvial deposits, and is so productive as frequently to yield 40 bushels of wheat or 100 bushels of Indian corn to the acre. Nearly all the tracts adjacent to the rivers are of this character. "The American Bottom," as it is called, is the richest river alluvium, and has been cropped without deterioration for a century. It extends along the Mississippi for 90 m.; but in consequence of its lia-

bility to inundation, much of it is uncultivated. The prairies, although less productive, are still very fertile, and on account of their greater salubrity are preferred for farms, wherever wood is to be obtained. In 1879 there were 25,882,861 acres of land in farms, and 6,019.531 acres in woodland (of which 5,061,578 acres were included in farms) — Important and valuable minerals abound in this State. Bituminous coal occurs in almost every county, and in some instances may be obtained without excavation. Vast beds are found on the bluffs adjacent to the "American Bottom"; and it has been reported that anthracite coal has been found in the county of Jackson. But the great coal region is an extensive tract which extends quite across the State from Missouri to Indiana, and from Iowa to Kentucky (see COAL). Iron has been found in the S. part of the State, and is said to be plentiful in the N. The great lead region is shared between Illinois, Iowa, and Wisconsin. Galena, in the N. W., is nearly supported by this mineral. Silver has also been found in the W. part of the State, and copper is obtained in several places. The other minerals found here are zinc, gypsum, quartz, crystals, etc. — The relative value of agricultural products of *I.* for the year 1878 is given in this work under the names of each of the principal crops. In that year there were about 200 butter and cheese factories in operation in the State, and the value of the annual product of the factories and milk-condensing establishments was over $2,000,000; and all the dairy products of the State were more than double this estimate. — According to the last census, Illinois ranked sixth among the States of the Union in the amount of capital invested in manufactures and in the value of products. In the total amount of capital it was surpassed by New York, Pennsylvania, Massachusetts, Ohio, and Connecticut: in the value of products by New York, Pennsylvania, Massachusetts, Ohio, and Missouri. In the production of agricultural implements, Illinois ranked next to Ohio and New York; In carriages and wagons, next to New York and Pennsylvania; in sashes, doors, and blinds, next to New York, Pennsylvania, Missouri, and Ohio; in men's clothing, next to New York, Pennsylvania, Massachusetts, and Ohio; in oil, next to New York and Pennsylvania; in grease and tallow, next to New York; while in the products of butchering, distilled liquors, planed lumber, and pork packed, it ranked first. Illinois also ranks first among all States in the number of miles of railroad it possesses The following table exhibits the names of the lines lying wholly or partly within the State, the number of miles completed in 1879, and the entire length of the lines.

NAMES OF COMPANIES.	Total length of line.	Total length of line in Illinois.
	Miles.	Miles.
Baltimore and Ohio and Chicago	271 00	5.90
Cairo and St. Louis	146.50	146.50
Cairo and Vincennes	157 00	150.20
Carbondale and Shawneetown	18.50	18.50
Chicago and Alton	677.78	576.24
Chicago, Burlington, and Quincy	1,349 25	826.36
Chicago and Eastern Illinois	152.26	132 47
Chicago and Iowa	104.00	104 00
Chicago, Milwaukee, and St Paul	1,412 34	45 00
Chicago and Northwestern	1,615.96	489.35
Chicago and Pacific	88 30	88 30
Chicago and Paducah	164.50	164.50
Chicago, Pekin, and Southwestern	94.10	91.10
Chicago, Rock Island, and Pacific	1,032.28	235.43
Cincinnati, Lafayette, and Chicago	56.30	32 30
Decatur, Mattoon, and Southern	32.00	32.00
East St. Louis and Carondelet	11 50	11 50
Evansville, Terre Haute, and Chicago	49.28	6.10
Galena and Southern Wisconsin	30.00	10 00
Grand Tower Mining, Manufacturing, and Transportation Co	25 00	25.00
Grayville and Mattoon	71.25	71 25
Havana, Rantoul, and Eastern	40.00	40 00
Illinois Central	816 97	816.97
Illinois Midland	175 70	167 40
Illinois and St. Louis	18 00	18.00
Indianapolis, Bloomington, and Western	333.40	253.40
Indianapolis, Decatur, and Springfield	85.25	75 76
Indianapolis and St. Louis	193 00	185.00
Jacksonville, Northwestern, and Southeastern	30.70	30.70
Lafayette, Bloomington, and Mississippi	80 13	80.13
Lake Shore and Michigan Southern	1,176.80	14.00
Louisville, New Albany, and St. Louis	28.00	18.00
Michigan Central	785 80	34.47
Ohio and Mississippi	615.00	390.00
Paris and Danville	103.10	103.10
Pekin, Lincoln, and Decatur	76.55	76.55
Peoria, Pekin, and Jacksonville	83.00	83.00
Pittsburgh, Cincinnati, and St. Louis	580.50	27.90
Pittsburgh, Fort Wayne, and Chicago	468 30	14.75
Rock Island and Mercer County	21.80	21.80
Rock Island and Peoria	91 00	91.00
St. Louis, Alton, and Terre Haute	71.00	71 00
St. Louis, Rock Island, and Chicago	307 80	307 80
St. Louis, Vandalia, and Terre Haute	158 30	158 30
St. Louis and Southeastern	355 00	181.00
Springfield and Northwestern	45 20	45 20
Sycamore and Cortland	4.90	4 90
Toledo, Peoria, and Warsaw	247.00	247 00
Wabash Railway	686.55	444 17
Wabash, Chester, and Western	41.74	41 74
Western Union	212 75	127 55
Total	15,492.34	7,405 60

In 1879 Illinois had 139 national banks in operation, whose paid-in capital was $17,194,600. There were, besides, 319 State banks, savings-banks, and private bankers, whose capital was $4,509,738, and deposits, $12,472,557. The number of fire, marine, and inland insurance companies authorized to do business in the State was 181, of which 8 were joint-stock and 2 mutual companies of Illinois, 146 joint-stock and 8 mutual companies of other States, and 17 foreign companies. The risks written in the State for the year 1877 by all companies (including 119 district, county, and township mutual fire-insurance companies) amounted to $474,531,241. The total amount of premiums on insured property in the State during the year was $4,908,295, and the losses paid, $1,929,841, which is only 42 per cent of the premiums. The following table shows the valuation of property for the purposes of taxation, and the State debt, for a series of years: —

Year.	Real Estate.	Personal Property.	Railroad Property.	State Debt.
	$	$	$	$
1851	98,748,533	39,069,546		16,000,000
1855	234,590,084	95,927,235		15,190,000
1860	266,258,155	88,884,115	12,085,472	11,804,000
1865	262,114,308	116,302,295	13,911,303	11,178,000
1870	347,876,690	113,545,227	19,242,141	4,890 937
1871	356,244,708	113,915,561	25,516,042	1,892,496
1872	371,619,940	113,607,959	25,658,784	2,060,150
1873	899,434,748	308,119,271	133,807,823	1,706,750
1874	847,947,477	264,785,202	81,723,772	1,730,972
1875	789,208,982	235,834,418	60,496,456	1,480,582
1876	747,512,376	209,281,245	44,329,489	1,480,600
1877	700,096,143	189,465,922	41,637,243	1,442,464
1878	649,094,336	167,679,561	40,461,865	802,312

The State possesses an industrial university, which was opened to students of both sexes in 1868, and is situated at Urbana. The property and funds of this important institution amount to about $800,000. It embraces schools of agriculture, horticulture, and fruit-growing; mechanical science, civil and mining engineering, and architecture; modern and ancient languages and literature; commerce; military science; and domestic science and arts. See CHICAGO.

Illinois Central R.R. runs from Cairo to Chicago, Ill., 364.73 m. and from Centralia to Dunleith, 340.77 m., total 705 50 m. The following lines are owned or leased by the Co., whose offices are in Chicago: The Kanakee and South Western R.R., from Otto to Chatsworth, Ill., 36 76 m.; the Chicago and Springfield R.R., from Gilman, 1 m. distant from Chicago, to Springfield, 111.47 m.; the Dubuque and Sioux City R.R., from Dubuque to Iowa Falls, Ia., 142.89 m.; the Iowa Falls and Sioux City R.R., from Iowa Falls to Sioux City, Ia., 183.69 m.; the Cedar Falls and Minnesota R.R., from Waterloo, Ia., to State line, Minn., 75.58 m., being a total of 1,255.89 m. The Co. organized in 1851 has a controlling interest in the Chicago, St. Louis, and New Orleans R.R., by which the interest of the line is extended to New Orleans. The two roads connect at Cairo by means of a steamboat. *Financial statement:* Cap. stock, $29,000,000; funded debt, $10,397,000; 6% currency bonds secured by mortgage on Springfield Division, $1,600,000, consisting of 1st mortgage 6% 20-year bonds, payable in 1898. State-

ment of funded debt in detail: Redemption currency 6% 25-year bonds, payable in 1890, $2,500,000; sterling (£500,000) 6% 20-year bonds payable in 1895, $2,500,000; sterling (£200,000) mortgage 5% 30-year bonds, payable in 1905, $1,000,000; sterling (£2,000,000) sinking-fund 5% 30-year bonds, payable in 1903, $4,393,000; construction 7% bonds payable 1875 (past due), $4,000. Land department. In 1850 the States of Illinois, Mississippi, and Alabama received by act of Congress the grant of the right of way through the public lands and also three alternate sections of land on each side of the road for every mile of R.R. constructed and equipped, as aid towards the building of a railroad from Lake Michigan and the Upper Mississippi to the Gulf of Mexico. Up to 1879, 2,224,013.24 acres had been conveyed, leaving 370,986.76 acres unconveyed. 2,304,651.96 acres of the donated lands have been sold. The total amount of dividends paid to stockholders up to and including 1878 was $34,835,347.

Illinois Midland R.R. runs from Terre Haute, Ind., to Peoria, Ill., 175.7 m. This Co., whose offices are in Terre Haute, was formed by the consolidation, in 1874, of the Peoria, Atlanta, and Decatur, the Paris and Decatur, and the Paris and Terre Haute R.R. Cos. In 1875 the road was placed in the hands of a receiver. *Financial statement:* Cap. stock, $2,000,000; funded debts, $4,175,000, consisting of 1st mortgage 7% bonds issued in 1875, payable in 1905, interest January and July.

Illipe Oil, Illipoo, Ilpa, Epei Oil, a light, greenish-yellow, aromatic oil expressed from the seeds of *Bassia longifolia*, a tree growing on the coasts of Coromandel and Bengal. In the fluid form it resembles palm-oil, and it becomes solid below 82° F. It is used in the East Indies for illumination, and for the manufacture of soap.

Ill-Manned, short-handed; a vessel that has not a proportionate number of seamen to her size and tonnage is said to be ill-manned.

Illuminating, a mode of painting or emblazoning books and manuscripts with ornamental letters. — Placing lights at the windows or in front of a house on festive occasions or days of rejoicing.

Illuminating Oils. See Oil.

Illumination, the act of illuminating or making luminous. For supplying artificial light to streets and the interior of houses, coal-gas and oil and fats are generally employed. These illuminating agents are compounds rich in carbon, upon the presence of which the brightness of their flames depends. Flame is gas or vapor heated to incandescence during the process of combustion. A flame containing no solid particles emits but a feeble light, even if its temperature is the highest possible. Pure hydrogen, for instance, burns with a pale, smokeless flame, though with the production of considerable heat. On the other hand, wax, kerosene, coal-gas, etc., while undergoing combustion, give out considerable light, because their flames contain innumerable solid particles of carbon, which act as radiant points.

To give the greatest degree of luminosity to flame, the supply of air must be proportioned to the character of the burning substance, and be insufficient for the instantaneous combustion of the evolved gases; in which case the hydrogen takes all the oxygen, and the larger portion of the carbon is precipitated, and burnt in the solid form, at some little distance within the outer surface of the flame. When the supply of air is sufficient for the immediate and complete combustion of the whole of the combustible matter, no such precipitation takes place, and the flame is neither white nor brilliant. The richest coal-gas, mixed with sufficient air to convert all its hydrogen and carbon into water and carbonic acid, explodes with a pale blue flash; yet the same gas, when consumed in the ordinary way, burns with a rich white flame. Every one must have noticed the effect of a gust of wind upon the flaring gas-jets of a butcher's shop; the plentiful supply of air causes complete combustion, and so converts the bright white flames into dull blue streaks of fire. When the supply of air is insufficient to cause the combustion of the newly formed solid carbon at the instant of its development, and whilst it is in an incandescent state, the flame becomes red and smoky, and unburnt sooty particles are thrown off. The same occurs when the temperature of any portion of the hydrogen is reduced below that intensity required for the combustion of the newly separated charcoal. Solid bodies, as tallow, oils, and fats, which burn with flame, are converted into the state of gas by the heat required to kindle them, and it is this gaseous matter which suffers combustion, and not the substance which produces it. The following table exhibits the comparative cost of the light of 20 sperm candles, each burning 10 hours at the rate of 120 gr. per hour: also the amount of carbonic acid produced and heat evolved per hour, in obtaining this quantity of light: —

	Cost.	Carb. acid per hour in cubic feet.	Units of heat per hour.
	$		
Wax	1.80	8.3	82
Spermaceti	1.65		
Paraffin candles	1.00	6.7	66
Tallow	0.75	10.1	100
Rock oil	0.15	3.0	29
Kerosene	0.8		
Coal-gas	0.5	5.0	47

These figures prove that coal-gas and the mineral oils are the cheapest and best illuminating agents, producing the largest amount of light with the least development of heat.

The light emitted by incandescent lime (*Drummond light, hydro-oxygen light, lime light, oxyhydrogen light*) is intensely brilliant, and is often made use of to enable workmen to continue operations at night. It is obtained by directing the flame produced by the combustion of a mixture of hydrogen (or coal-gas) and oxygen upon a small cylinder of lime. In the improved form of this light the lime is protected from crumbling by a cage of platinum wire, and is caused to rotate slowly by means of clock-work, so as constantly to expose a fresh surface to the flame. When reflected from a "parabolic mirror" in a pencil of parallel rays, the Drummond light has been recognized during daylight at a distance of 108 miles. The most powerful illuminator, however, is the *electric light*. See Light (Electric).

Illustration, a woodcut or stereotype block; an impression taken therefrom.

Illustrator, a commentator; a draughtsman or designer.

Image, properly, an imitation or copy of anything; a likeness; a representation; a representation or similitude of any person or thing formed of a material substance. In commerce, this name is often applied to plaster casts or statues, and to figures in stone, wood, wax, or other materials.

Imitation, a counterfeit; a copy in inferior materials.

Imitator, a copyist; one who follows a set pattern.

Immersion, the act of plunging or dipping into a fluid.

Immigrant, a passenger who arrives in a country to settle; the term is only used when large bodies of passengers arrive together in vessels; when quitting they are termed emigrants, as they go forth to establish themselves elsewhere. See Emigration.

Immovables, lands; houses; fixtures.

Immunity, a freedom from tax, office, or obligation, etc.

Impediment, an obstacle or hindrance to progress; an obstruction to navigation, or to any undertaking.

Imperial, relating to royalty. — Anything large, as a large kind of slate, a large portmanteau, etc. — A large-sized paper, 22 × 32 (printing-paper); 22 × 30 (flat writing-paper); 22 × 30 to 23 × 31 (blank-book paper).

Imperial Bushel. See Bushel.

Imperial Drills, linen fabrics, differing from ordinary drills in being woven with two threads

warp and three filling, while ordinary drills are single threads.

Imperial Gallon. See GALLON.

Imperishable, not subject to decay; indestructible, calculated to last long.

Impermeable, any textile substance rendered water-proof by the application of some solution, and a variety of other means. Petroleum, whiting, and water; alum, white-lead, and water; the same ingredients with acetic acid added; tar, as for tarpaulins; oil, as for oil-skin; a mixture of boiled oil, pipe-clay, burnt umber, white-lead, and pumice-stone; etc. Some special kinds have been applied to leather rather than cloth, such as a mixture of linseed-oil, suet, beeswax, and resin; a mixture of linseed-oil, resin, white vitriol, turpentine, and sawdust; a mixture of beeswax, Burgundy pitch, turpentine, and linseed-oil; and others in which tallow is a principal ingredient. But the chief water-proofing agent is india-rubber. Cloth saturated with this gum is extensively used for outer garments, life-jackets and belts, life-buoys, collapsible boats, beds, hammocks, mattresses, cushions, umbrella tents, portable bottles, shoes, and countless other articles.

Impinge, to fall or strike against.

Implements, tools; utensils; vessels; instruments; the tools or instruments of labor. "Wearing-apparel in actual use, and other personal effects (not merchandise), professional books, implements, and tools of trade, occupation, or employment of persons arriving in the U. States, are admitted free of duty. But this exemption shall not be constructed to include machinery, or other articles imported for use in any manufacturing establishment, or for sale." —*U. States Statutes, Section* 2505.

Implicate, to embarrass; to connect with.

Important, urgent; of great consequence.

Importation and Exportation, the bringing of commodities from and sending them to other countries. A very large portion of the revenue of the U. States being derived from customs duties, or from duties on commodities imported from abroad, and drawbacks being given on a few articles exported, the business of importation and exportation is subject to various regulations which must be carefully observed by those who would avoid incurring penalties, and subjecting their property to confiscation. The regulations referred to are embodied chiefly in Title xxxiv of the Revised Statutes of the U. States (Edition 1878). We subjoin an extract of such portions of this which relate to the *entry of merchandise* and *payment of duties*, referring for other parts of the subject to the headings APPRAISEMENT, BILL OF LADING, DRAWBACK, INVOICE, MANIFEST, PORTS OF ENTRY AND DELIVERY, WAREHOUSING, etc.

When vessels from foreign ports may enter and unlade. It shall not be lawful to make entry of any such vessel elsewhere than at one of the ports of entry designated by law; nor to unlade the cargo, or any part thereof, elsewhere than at one of the ports of delivery, designated by law, except that every port of entry shall be also a port of delivery (*Sec.* 2770). — Vessels which are not vessels of the U. States shall be admitted to unlade only at ports of entry established by law; and no such vessel shall be admitted to make entry in any other district than in the one in which she shall be admitted to unlade (*Sec.* 2771). — The master of every vessel bound to a port of delivery only, in any district, shall first come to at the port of entry of such district, with his vessel, and then make report and entry in writing, and pay all duties required by law, port fees and charges, before such vessel shall proceed to her port of delivery. Any master of a vessel who shall proceed to a port of delivery contrary to such directions shall be liable to a penalty of $500, to be recovered with costs of suit (*Sec.* 2772).

Duty of making report on arrival. — Within 24 hours after the arrival of any vessel, from any foreign port, at any port of the U. States established by law, at which an officer of the customs resides, or within any harbor, inlet, or creek thereof, the master shall repair to such office, and make report to the chief officer of the arrival of the vessel; and he shall, within 48 hours after such arrival, make a further report in writing, to the collector of the district, which report shall be in the form, and shall contain all the particulars required to be inserted in, and verified like, a manifest. Every master who shall neglect or omit to make either of such reports and declarations, or to verify any such declaration as required, or shall not fully comply with the true intent and meaning of this section, shall, for each offence, be liable to a penalty of $1,000 (*Sec.* 2774.). — The master of any vessel having on board *distilled spirits or wines*, shall, within 48 hours after his arrival, whether the same be at the first port of arrival of such vessel or not, in addition to the requirements of the preceding section, report in writing to the surveyor or officer acting as inspector of the revenue of the port at which he has arrived, the foreign port from which he last sailed, the name of his vessel, his own name, the tonnage and denomination of such vessel, and to what nation belonging, together with the quantity and kinds of spirits and wines, on board of the vessel, particularizing the number of casks, vessels, cases, or other packages containing the same, with their marks and numbers, as also the quantity and kinds of spirits and wines, on board such vessel as sea-stores, and in default thereof he shall be liable to a penalty of $500, and any spirits omitted to be reported shall be forfeited (*Sec.* 2775).

Requisite of an entry of goods generally The owner or consignee of any merchandise on board of any such vessel, or, in case of his absence or sickness, his known agent or factor in his name, within 15 days after the report of the master to the collector of the district for which such merchandise shall be destined, shall make entry thereof in writing with the collector, and shall in such entry specify the name of the vessel and of her master, in which, and the port or place from which, such merchandise was imported, the particular marks, numbers, denominations, and prime cost, including charges of each particular package or parcel whereof the entry shall consist, or, if in bulk, the quantity, quality, and prime cost, including charges thereof, particularly specifying the species of money in which the invoices thereof are made out. Such entry shall be subscribed by the person making it, if the owner or consignee, in his own name, or, if another person, in his name as agent or factor, for the owner or consignee. The person making such entry shall also produce to the collector and naval officer, if any, the original invoices of the merchandise, or other documents received in lieu thereof, or concerning the same, in the same state in which they were received, with the bills of lading for the same; which invoices shall be signed by the persons in the offices of the collector and naval officer who have compared and examined them (*Sec.* 2785). — The entries to be made by any importer, consignee, or agent, under the preceding section, shall be verified by the oath of the person making the same (*Sec.* 2786).

Bond by agent. Whenever any entry is made with the collector of any district, of merchandise imported into the U. States subject to duty, by any agent, factor, or person, other than the person to whom it belongs, or to whom it is ultimately consigned, the collector shall take a bond with surety from such agent, factor, or person, in the penal sum of $1,000, with condition that the actual owner or consignee of such merchandise shall deliver to the collector a full and correct account of the merchandise imported by him, or for him on his own account, or consigned to his care, in the same manner and form as required in respect to an entry previous to the landing of merchandise; which account shall be verified by a like oath, as in the case of an entry, to be taken and subscribed before any judge of the U. States, or the judge of any court of record of a State, or before any collector of the customs. In case of the payment of the duties at the time of entry, by any factor or agent, on the merchandise entered by him, the condition of the bond shall be to produce the account of the proper owner, or consignee, verified in manner as before directed, within 90 days from the date of such bond (*Sec.* 2787).

Entry when particulars are unknown. Where the particulars of any merchandise are unknown, in lieu of the entry prescribed above, an entry thereof shall be made and received according to the circumstances of the case; the party making the same declaring upon oath all that he knows or believes concerning the quality and particulars of the merchandise, and that he has no other knowledge or information concerning the same (*Sec.* 2788).

Custody when invoice is imperfect. Whenever an entry of merchandise is imperfect, for want of invoices, bills of lading, or for any other cause, the collector shall take the merchandise into his custody, until the quantity, quality, or value thereof, as the case may require, can be ascertained (*Sec.* 2789).

Vessel's papers to be produced to collector. The register, or other document in lieu thereof, together with the clearance and other papers granted by the officers of the customs to a vessel at her departure from the port from whence she may have arrived, Mediterranean passports excepted, shall previous to entry be produced to the collector with whom such entry is to be made, and shall remain in his office; and on the clear-

ance of such vessel the register and other documents shall be returned to the master or owner of such vessel (*Sec.* 2789).

Entry of spirits and wines. Every importer of distilled spirits or wines, or person to whom they are consigned, shall make a separate and additional entry thereof, specifying the name of the vessel, and her master, in which, and the place from which, such spirits or wines were imported, together with the quantity and quality thereof, and a particular detail of the casks or receptacles containing the same, with their marks and numbers; such entry shall be subscribed by the person making the same, for himself, or in behalf of the person for whom such entry is made, and shall be certified by the collector before whom it is made, as a true copy, and conformable to the general entry before directed, in respect to all distilled spirits and wines therein contained (*Sec.* 2794).

Baggage and tools. In order to ascertain what articles ought to be exempted, as the wearing-apparel and other personal baggage, and the tools and implements of a mechanical trade only, of persons who arrive in the U. States, due entry thereof, as of other merchandise, but separate and distinct from that of any other merchandise, imported from a foreign port, shall be made with the collector of the district in which the articles are intended to be landed by the owner thereof, or his agent, expressing the persons by whom or for whom such entry is made, and particularizing the several packages, and their contents, with their marks and numbers: and the person who shall make the entry shall take and subscribe an oath before the collector, declaring that the entry subscribed by him and to which the oath is annexed contains, to the best of his knowledge and belief, a just and true account of the contents of the several packages mentioned in the entry, specifying the name of the vessel, of her master, and of the port from which she has arrived; and that such packages contain no merchandise whatever other than wearing-apparel, personal baggage, or, as the case may be, tools of trade, specifying it; that they are all the property of a person named who has arrived, or is shortly expected to arrive, in the U. States, and are not directly or indirectly imported for any other, or intended for sale (*Sec.* 2799). — Whenever the person making entry of any such articles is not the owner of them, he shall *give bond* with one or more sureties, to the satisfaction of the collector, in a sum equal to the duties on like articles imported subject to duty, upon the condition that the owner of the articles shall, within one year, personally make an oath such as is prescribed in the preceding section (*Sec.* 2800). — Whenever any article subject to duty is found in the baggage of any person arriving within the U. States, which was not, at the time of making entry for such baggage, mentioned to the collector before whom such entry was made, by the person making entry, such article shall be forfeited, and the person in whose baggage it is found shall be liable to a penalty of treble the value of such article.

Entry, etc., of cigars. No cigars shall be imported unless the same are packed in boxes of not more than 500 cigars in each box; and no entry of any imported cigars shall be allowed of less quantity than 3,000 in a single package; and all cigars on importation shall be placed in public store or bonded warehouse, and shall not be removed therefrom until the same shall have been inspected and a stamp affixed to each box indicating such inspection, with the date thereof (*Sec.* 2803). See TOBACCO.

Oaths, how taken. All oaths to be taken upon making of any of the reports or entries, or respecting any of the acts mentioned in this chapter, whether by a master of any vessel, or the owner or consignee of any merchandise, his factor or agent, or by any other person, shall be administered by the collector, or officer to or with whom the report or entry is made, and shall be reduced to writing, and subscribed by the person taking and by the person administering the oath (*Sec.* 2805).

Forfeiture when cost is not set forth in invoice. If any merchandise, of which entry has been made in the office of a collector, is not invoiced according to the actual cost thereof at the place of exportation, with design to evade payment of duty, all such merchandise, or the value thereof, to be recovered of the person making entry, shall be forfeited (*Sec.* 2839).

Collector to take possession when invoice is not correct. In every case in which a collector shall suspect that any merchandise is not invoiced at a sum equal to that for which it has usually been sold in the place or country from whence it was imported, he shall take the merchandise into his possession, and retain the same with reasonable care, at the risk and expense of the owner or consignee, until its value at the time and place of importation has been ascertained, as in the case of damaged merchandise, or of merchandise not accompanied with an invoice, and until the duties arising, according to such valuation, have been paid, or secured to be paid. But in case of a prosecution for forfeiture, such appraisement shall not exclude other proof, upon the trial, of the actual cost of the merchandise at the place of exportation (*Sec.* 2840). See APPRAISEMENT.

Oaths to accompany invoices. Whenever merchandise imported into the U. States is entered into invoice, one of the following oaths, according to the nature of the case, shall be administered by the collector of the port, at the time of entry, to the owner, importer, consignee, or agent (*Sec.* 2841).

1. *Oath of consignee, importer, or agent.*

I, ———, do solemnly and truly swear (or affirm) that the invoice and bill of lading now presented by me to the collector of ———, are the true and only invoice and bill of lading by me received, of all the goods, wares, and merchandise imported in the ———, whereof ——— is master, from ———, for account of any person whomsoever, for whom I am authorized to enter the same; that the said invoice and bill of lading are in the state in which they were actually received by me, and that I do not know nor believe in the existence of any other invoice or bill of lading of the said goods, wares, and merchandise; that the entry now delivered to the collector contains a just and true account of the said goods, wares, and merchandise, according to the said invoice and bill of lading; that nothing has been, on my part, nor to my knowledge on the part of any other person, concealed or suppressed, whereby the United States may be defrauded of any part of the duty lawfully due on the said goods, wares, and merchandise, and that if, at any time hereafter, I discover any error in the said invoice, or in the account now rendered of the said goods, wares, and merchandise, or receive any other invoice of the same, I will immediately make the same known to the collector of this district. And I do further solemnly and truly swear (or affirm) that, to the best of my knowledge and belief, (insert the name and residence of the owner or owners,) is (or are) [the owner (or owners)] of the goods, wares, and merchandise mentioned in the annexed entry; that the invoice now produced by me exhibits the actual cost, (if purchased,) or fair market value, (if otherwise obtained,) at the time or times, and place or places, when or where procured, (as the case may be,) of the said goods, wares, and merchandise, all the charges thereon, and no other or different discount, bounty, or drawback, but such as has been actually allowed on the same.

2. *Oath of owner in cases where merchandise has been actually purchased.*

I, ———, do solemnly and truly swear (or affirm) that the entry now delivered by me to the collector of ——— contains a just and true account of all the goods, wares, and merchandise, imported by or consigned to me, in the ———, whereof ——— is master, from ———; * that the invoice which I now produce contains a just and faithful account of the actual cost of the said goods, wares, and merchandise, of all charges thereon, including charges of purchasing, carriages, bleaching, dyeing, dressing, finishing, putting up, and packing, and no other discount, drawback, or bounty, but such as has been actually allowed on the same; that I do not know nor believe in the existence of any invoice or bill of landing other than those now produced by me, and that they are in the state in which I actually received them. And I do further solemnly and truly swear (or affirm) that I have not, in the said entry or invoice, concealed or suppressed anything whereby the U. States may be defrauded of any part of the duty lawfully due on the said goods, wares, and merchandise; and that if, at any time hereafter, I discover any error in the said invoice, or in the account now produced of the said goods, wares, and merchandise, or receive any other invoice of the same, I will immediately make the same known to the collector of this district.

3. *Oath of manufacturer or owner in cases where merchandise has not been actually purchased.*

As No. 2, except that at the place marked * must be introduced the following: "That the said goods, wares, and merchandise were not actually bought by me, or by my agent, in the ordinary mode of bargain and sale, but, nevertheless," that the invoice . . . . (*continue as in No.* 2.)

Separate entry of packages contained in one importation. A separate entry may be made of one or more packages contained in an importation of packed packages consigned to one importer or consignee, and concerning which packed packages, no invoice, or statement of contents or values has been received. Every such entry shall contain a declaration of the whole number of parcels contained in such original packed package; and shall embrace all the goods, wares, and merchandise imported in one vessel at one time for one and the same actual owner, or ultimate consignee. 2. The importer, consignee, or agent's oath prescribed by *Sec.* 2841 of the Revised Statutes (see above), is hereby modified for the purposes of this act, so as to require the importer, consignee, or agent, to declare therein that the entry contains an account of all the goods ———, imported in the ———, whereof ——— is master, from ———, for account of ———, with oath so modified, shall in each case be taken on the entry of one or more packages contained in an original package. But nothing in this act contained shall be construed to relieve the importer, consignee, or agent from producing the oath of the owner or ultimate consignee in every case, now required by law; or to provide that an importation may consist of less than the whole number of parcels contained in any packed package, or packed packages consigned in one vessel at one time, to one importer, consignee, or agent. 3. All provisions of law inconsistent herewith are hereby repealed (*Act of Congress, May* 1, 1876).

Bond for production of invoice of goods of absent owner. No merchandise subject to ad-valorem duty imported into the U. States, and belonging to a person residing in the U. States, but at the same time absent from the place where the merchandise is intended to be entered, shall be admitted to an entry, unless the importer, consignee, or agent, shall previously give bond, the form of which shall be prescribed by the Secretary of the Treasury, with sufficient sureties, to produce, within four months, to the collector of the port where the merchandise may be, the invoice of the same duly certified, according to the circumstances of the case, by the oath of the owner, or one of the owners; which oath shall be administered by a collector, if there is any in the place where the owner may be; or, if there is none, by some public officer duly authorized to administer oaths.

(For further prescriptions concerning invoices see INVOICE).

Suits to recover duties unduly paid. Any person who shall have made payment under protest and in order to obtain possession of merchandise imported for him, to any collector, or person acting as collector, of any money as duties, when such amount of duties was not, or was not wholly, authorized by law, may maintain an action in the nature of an action at law, which shall be triable by jury, to ascertain the validity of such demand and payment of duties, and to recover back any excess so paid. But no recovery shall be allowed in such action unless a protest (*in writing and signed by the claimant or his agent, was made and delivered at or before the payment, setting forth distinctly and specifically the grounds of objection to the amount claimed*), and appeal to the Secretary of the Treasury shall have been taken within 30 days after the date of the ascertainment and liquidation of the duties by the proper officers of the customs (*Sec.* 3010).

Limitation; bill of particulars. No suit shall be maintained in any court for the recovery of duties alleged to have been erroneously or illegally exacted by collectors of customs, unless the plaintiff, within 30 days after due notice of the appearance of the defendant, either in person or by attorney, serves on the defendant or his attorney a bill of particulars of the plaintiff's demand, giving the name of the importer or importers, the description of the merchandise, and place from which imported, the name of the vessel, or means of importation, the date of the invoice, the date of the entry at the custom-house, the precise amount of duty claimed to have been exacted in excess, the date of payment of said duties, the day and year on which protest was filed against the exaction thereof, the date of appeal thereon to the Secretary of the Treasury, and date of decision, if any, on such appeal. And if a bill of particulars, containing all the above mentioned items, be not served as aforesaid, a judgment of non. pros. shall be rendered against the plaintiff or plaintiffs in said action (*Sec.* 3012).

Refunding duties improperly collected. Whenever it shall be shown to the satisfaction of the Secretary of the Treasury that, in any case of unascertained duties, or duties or other moneys paid under protest and appeal, as hereinbefore provided, more money has been paid to the collector, or person acting as such, than the law requires should have been paid, the Secretary of the Treasury shall draw his warrant upon the Treasurer in favor of the person entitled to the overpayment directing the Treasurer to refund the same out of any money in the Treasury not otherwise appropriated (*Sec.* 3012½).

Refunding duties upon failure to appeal. Whenever it shall be shown to the satisfaction of the Secretary of the Treasury that more moneys have been paid to the collector of customs, or others acting as such, than the law requires, and the party has failed to comply with the requirements relating to appeals to the Secretary of the Treasury, and the Secretary of the Treasury shall be satisfied that such non-compliance with the requirements as above stated was owing to circumstances beyond the control of the importer, consignee, or agent making such payments, he may draw his warrant upon the Treasurer in favor of the person entitled to the overpayment (*Sec.* 3013).

Imported, a collective name for all goods and merchandise introduced from foreign countries.

Importer, one who receives goods, produce, manufactures, or merchandise from abroad, with the intent to sell them again.

Importers and Traders, a fire-insurance Co located in New York City, organized in 1859. Statement, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; surplus, $111,828.32; risks in force, $10,052,980; premiums, $75,831.25; premiums received since the organization of the Co. $1,227,396.86; losses paid, $619,856.26; cash dividends paid to stockholders, $286,000.

Imports and Exports, the articles imported into or exported from a country. The following table gives a complete view of the trade of the U. States with all parts of the world for a number of years; and those dispersed through the work give a view of that trade in detail, that is, in particular articles and with particular countries.

Value of merchandise imported into and exported from the U. States from 1850 to 1879 (gold and silver coin and bullion excepted).

Year ended June 30—	Exports. Domestic.	Exports. Foreign.	Imports.	Total Imports and Exports.
	$	$	$	$
1850....	134,900,233	9,475,493	173,509,526	317,885,252
1851 ..	178,620,138	10,295,121	210,771,429	399,686,688
1852 ...	154,931,147	12,053,084	207,440,398	374,424,629
1853....	189,869,162	13,620,120	263,777,265	467,266,547
1854 ...	213,985,236	21,031,260	297,623,039	533,231,535
1855...	192,751,135	26,158,368	257,808,708	476,718,211
1856....	266,438,051	14,781,372	310,432,310	591,651,733
1857....	278,906,713	14,917,047	348,128,342	641,952,102
1858....	251,351,033	20,660,241	263,338,654	535,349,928
1859....	278,392,080	14,509,971	331,333,341	624,235,392
1860. ..	316,242,423	17,333,634	353,616,119	687,192,176
1861....	204,899,616	14,654,217	289,310,542	508,864,375
1862. ..	179,644,024	11,026,477	189,356,677	380,027,178
1863....	186,003,912	17,960,535	243,335,815	447,300,262
1864....	143,504,027	15,333,961	316,447,283	475,285,271
1865....	136,940,248	29,089,055	238,745,580	404,774,883
1866. ..	337,518,102	11,341,420	434,812,066	783,671,588
1867....	279,786,809	14,719,332	395,761,096	690,267,237
1868....	269,389,900	12,562,999	357,436,440	639,389,339
1869....	275,166,697	10,951,000	417,506,379	703,624,076
1870....	376,616,473	16,155,295	435,958,408	828,730,176
1871. ..	428,398,908	14,421,270	520,223,684	963,043,862
1872....	428,487,131	15,690,455	626,595,077	1,070,772,663
1873....	505,033,439	17,446,483	642,136,210	1,164,616,132
1874....	569,433,421	16,849,619	567,406,342	1,153,689,382
1875....	499,284,100	14,158,611	533,005,436	1,046,448,147
1876....	525,582,247	14,802,424	460,741,190	1,001,125,881
1877....	589,670,224	12,804,996	451,323,126	1,053,798,346
1878....	680,709,268	14,156,498	437,051,532	1,131,917,298
1879....	698,340,700	12,098,651	445,777,775	1,156,217,216

The above table shows that the total gold value of exports of domestic merchandise from the U. States had increased from $275,166,697 in 1869 to $698,340,790 in 1879, an increase of 154 per cent. With one or two unimportant exceptions, as seen in the following table, the U. States stands alone among the commercial nations in having an excess of exports over imports of merchandise. The increase in the value of our exports is derived mainly from breadstuffs, preserved meats, copper, live animals, agricultural implements, furs and fur-skins, distilled spirits, and refined sugar. Many other articles exhibit a large increase in the quantity exported, but a decrease in value, owing to their lower prices. The articles which show the greatest increase in the quantities exported are wheat, flour, oats, corn, rye, copper, cotton, petroleum and other oils, provisions, quicksilver, distilled spirits, starch, sugar, molasses, tallow, and leaf tobacco. The value of the exports of breadstuffs for the year 1879 amounted to $210,355,528, and constituted 30 per cent of the total value of our exports of domestic merchandise, while for the year 1873 the same amounted only to $98,743,151. The almost unlimited capacity of the Western and Northwestern States for the production of cereals, in connection with the facilities for cheap transportation, has brought them in sharp competition with the older States and with foreign countries. Many products of American manufacture, previously exported in small quantities, or not at all, now find profitable markets in foreign countries, and some of these products are now exported to countries from which, a few years ago, they were largely imported into the U. States. The importation of merchandise into the U. States amounted to $642,136,210 for the

year 1873 It fell to $437,051,523, in 1878, and increased to $445,777,775 in 1879, — an increase of $8,726,252, or of two per cent as compared with the preceding year. The importation of railroad-bars declined from 531,537 tons in 1872 to 2,611 tons in 1879. The production of railroad-bars in the U. States during the year 1878 amounted to 788,112 tons.

The values of imports into, and of domestic exports from, the principal seaports of the U. States during the years 1860, 1870, and 1878, are shown as follows: —

Value of Imports at Seaports of the U. States.

Ports of importation.	1860.		1870.		1878.	
	Dollars.	Per cent of total.	Dollars.	Per cent of total.	Dollars.	Per cent of total.
Portland, Me	1,252,819	0.36	2,922.164	0.69	833,981	0.19
Boston	39,366,560	11.47	47,524,845	11.14	40,350.690	9 07
New York	233,692,941	68.07	293,990,006	68.91	313,179,649	70.40
Philadelphia	14,626,801	4.26	14,500,797	3.40	19,333,521	4.35
Baltimore	9,784,773	2.85	19,512,468	4.57	16,938,628	3 81
Charleston	1,569,570	0.46	505,699	0.12	134,564	0.03
Savannah	782,061	0.23	1,001,917	0.23	502,721	0.11
Mobile	1,050,310	0.30	1,349,488	0.32	1,218,442	0.27
New Orleans	22,922,773	6.71	14,993,754	3.51	11,253,255	2 53
Galveston	533,153	0.15	509,231	0.12	1,081,201	0.24
San Francisco	6,577,921	2.79	21,834,103	5.12	32,502,313	7.31
All other seaports	8,168,838	2 35	7,993,246	1.87	7,543,029	1.69
Total at seaports	343,328,520	100.00	426,637,718	100.00	444,871,994	100.00

Value of Domestic Exports from Seaports of the U. States.

Ports of Exportation.	1860.		1870.		1878.	
	Dollars.	Per cent of total.	Dollars.	Per cent of total.	Dollars.	Per cent of total.
Portland, Me	1,950,030	0.54	1,488,189	0.31	3,347,866	0.48
Boston	13,530,770	3.74	12,251,267	2 54	46,542,044	6.69
New York	120,630,955	33 32	209,972,491	43 47	338,992,748	48.72
Philadelphia	5,512,755	1 52	16,903,072	3 50	44,509,119	6.40
Baltimore	8,804,606	2.43	14,330,248	2.97	45,492,527	6.54
Charleston	21,179,350	5.85	10,772.071	2.23	17,727,783	2.55
Savannah	18,351,554	5.07	29,749,058	6.16	18,544,963	2.67
Mobile	38,670,183	10.68	22,422,631	4 64	9,464,087	1.36
New Orleans	107,812,580	29.78	107,658,042	22 29	85,368,466	12.27
Galveston	5,772,158	1.60	14,869,601	3.08	12,177,540	1.75
San Francisco	7,388,394	2.04	32,186,021	6.66	35,392,703	5.09
All other seaports	12,404,748	3 43	10,398,473	2 15	38,219,316	5.48
Total at seaports	362,008,083	100.00	483,001,164	100 00	695,779,162	100.00

Value of the World's Imports and Exports for the year 1876, reduced to dollars, and stated in round millions: —

I. — *Europe. Population*, 289,000,000.

	Imports.	Exports.
Great Britain	$1,876,000,000	$1,284,000,000
Germany	978,000,000	637,000,000
France	797,000,000	715.000,000
Russia	384,000,000	322,000.000
Austro-Hungary	267,000,000	297,000,000
Netherlands	303,000,000	226,000,000
Italy	265,000,000	243,000,000
Belgium	289,000,000	212,000 000
Spain	115,000,000	127,000,000
Turkey	92,000,000	50,000,000
Sweden	79,000,000	62,000,000
Denmark	64,000,000	50,000,000
Norway	49,000,000	29,000,000
Portugal	31,000,000	26,000,000
Roumania	16,000,000	28,000,000
Greece	24,000,000	35,000,000
Servia	6,000,000	8,000,000

II. — *North and South America. Population*, 84,840,000.

	Imports.	Exports.
United States	$460,700,000	$540,000,000
Brazil	100,000,000	107,000,000
Canada	99,000,000	85,000,000
Argentine Republic	36,000,000	49,000,000
Chili	39,000,000	38,000,000
Cuba	30,000,000	35,000.000
Peru	25,000,000	39,000,000
Mexico	30,000,000	33,000,000

North and South America. — Continued.

	Imports.	Exports.
English West Indies	$22,000,000	$20,000 000
French West Indies	12,500,000	15,500,000
Uruguay	14.000,000	13,500,000
Porto Rico	15,500,000	9,000,000
Venezuela	13.200,000	12,000,000
Central America	7,200,000	15,600,000
English Guiana	9,200,000	15.400,000
Colombia	7,200.000	10,600,000
Hayti	9,000,000	8,200.000
Newfoundland	7,600,000	6,800.000
Bolivia	5,800,000	5,000,000
Ecuador	1,200,000	4,000,000
St. Domingo	1,800.000	1,600,000
Dutch Guiana	1,400,000	1,200,000
French Guiana	1,400,000	200,000

III. — *Asia. Population*, 806,700,000.

	Imports.	Exports.
East Indies	$177.000,000	$295,000,000
China	105,500,000	121,000,000
Straits	53,000,000	48,600.000
Java, etc.	27,600,000	61,000,000
Japan	27,400,000	26,800,000
Ceylon,	26,800,000	30,200,000
French Cochin China	13.400,000	17,600,000
Sumatra and Dutch Indies	14,000,000	16,400,000
Asiatic Russia	16,800,000	7,600.000
Siam	7,800,000	9,000,000
Persia	5,400,000	2.800,000
French Indies	1,400,000	3,000,000
Formosa	1,600,000	2,000.000
Labuan	600,000	600,000

IV. — *Australasia. Population*, 1,800,000.

	Imports.	Exports.
Victoria	$83,400,000	$73,800,000
New South Wales	67,400,000	68,400,000
New Zealand	40,000,000	29,200,000
South Australia	21,000,000	24,200,000
Queensland	16,600,000	19,200,000
Tasmania	6,000,000	5,400,000
Sandwich Islands	1,600,000	2,200,000
Western Australia	1,800,000	2,000,000

V. — *Africa. Population*, 80,000,000.

	Imports.	Exports
Egypt	$29,200,000	$66,000,000
Algeria	42,600,000	33,400,000
Cape Colony	28,600,000	20,400,000
Mauritius	11,400,000	13,200,000
Reunion	4,400,000	5,000,000
Natal	5,200,000	3,200,000
Morocco	2,400,000	3,600,000
Tunis	2,400,000	3,400,000
Senegal	2,200,000	2,800,000
Zanzibar	2,200,000	2,000,000
Portuguese Colonies	1,800,000	1,200,000
Tripoli	1,400,000	1,400,000
Gambia	600,000	1,000,000

Recapitulation, etc.

	Imports.	Exports.	Per cent of Commerce, Imports and Exports.	Average per head Imports and Exports.
Europe	$5,650,400,000	$4,936,200,000	71.25	$34.52
America	958,500,000	1,107,200,000	15.28	25.22
Asia	489,000,000	641,600,000	8.09	1.40
Australasia	237,800,000	224,400,000	3.29	256.77
Africa	134,400,000	156,600,000	2.07	5.62
Total	$7,460,100,000	$6,466,000,000	100.00	

Imposing-Stone, the stone in a printing-office on which the pages or columns are arranged, and locked up in the chases, for press.

Imposition, an overcharge; a fraud. — That which is imposed by authority; as a tax, toll, duty, etc.

Impost, more commonly called *duty*, a tax or toll levied on goods imported.

Impostor, a cheat; one who defrauds.

Impressing, taking a copy of any work by printing, stamping, or marking with a die.

Impression, an effect made on any substance by a tool. — The copy taken from a die or seal. — The total number of sheets printed of a book or newspaper. — The copy of an engraving taken from a plate or wood block.

Impressment, a compulsory mode of obtaining seamen, for service in the navy, by a press-gang; sometimes still resorted to in Great Britain in time of war.

Imprest, an advance of public money to enable the person to whom it may be made to carry on some public service, — the term being used in opposition to final payment. The person to whom the advance is made is called the "imprest accountant." — *T. McElrath.*

Imprimatur, in countries subjected to the censorship of the press, a license to be granted by a public functionary appointed for the purpose before any book can be printed.

Imprint, the printer's name and address attached to the first or last leaf of a book or printed sheet.

Imprison, to incarcerate; to deprive of liberty.

Improvement, an alteration in anything for the better; an advance in prices; increased activity or briskness in trade. — An addition of some useful thing to a machine, manufacture, or composition of matter.

Patents. The patent-law of July 4, 1836, authorizes the granting of a patent for any new and useful improvement on any art, machine, manufacture, or composition of matter. But it is often difficult to say what is a new and useful improvement, the cases frequently approaching very near to each other. In the present improved state of machinery, it is almost impracticable not to employ the same elements of motion, and in some particulars the same elements of operation, to produce any new effect.

Improvident, thoughtless, careless, inconsiderate.

Inc, Ink, a long measure of Japan, equal to $2\frac{1}{10}$ yards.

Incandescence, a white heat; the appearance of metals when intensely heated.

Incendiary, one who sets fire to a dwelling-house, which crime, in law, is termed arson.

Incense, a name for odoriferous substances, used in churches, etc., for the purpose of producing aromatic or perfume odors. There is always a resin with an odoriferous gum, and the odor is developed by burning. Olibanum, styrax, benzoin, and cascarilla are used, but frankincense is the principal variety.

Inch, the twelfth part of a foot, and the smallest lineal measure to which a commonly recognized name is given; but subdivisions (generally decimal divisions) are used for many purposes. Formerly it was made to consist of 12 parts called lines, each of them being again divided into 12 parts called seconds, and so on.

Inch-Stuff, deal plank sawn to the thickness of an inch.

Incineration, the reduction of organic substances to ashes by combustion.

Incision, a cutting-mark or impression made on anything; the separation of the surface by a sharp instrument.

Incisor, a cutting tooth; those of the walrus, wild boar, hippopotamus, and some other animals, enter into commerce for ivory.

Incline, to lean over; to slope gradually, as an inclined plane.

Inclusive, comprehended in the number or sum.

Incombustibility, the property of being incapable of being kindled, or of being consumed by fire. Substances possessing this property are said to be incombustible, or fire-proof.

Incombustible fabrics. With a view of diminishing the danger of death by fire, to which women are more especially exposed, chemists have devoted considerable attention to the problem of rendering muslin and other light fabrics non-inflammable. This object may be obtained by steeping the fabric in almost any saline solution. Thus, cotton or linen stuffs prepared with a solution of borax, phosphate of soda, phosphate of ammonia, alum, or sal-ammoniac, may be placed in contact with ignited bodies without their suffering active combustion, or bursting into flame. The salts act by forming a crust of incombustible matter on the surface of the fibres. They do not, however, prevent carbonization taking place when the temperature is sufficiently high. It is by a knowledge of this property of culinary salt that jugglers are enabled to perform the common trick of burning a thread of cotton while supporting a ring or a small key, without the latter falling to the ground. The cotton is reduced to a cinder, but from the action of the salt its fibres still retain sufficient tenacity to

support a light weight. — The addition of about 1 oz. of alum or sal ammoniac to the last water used to rinse a lady's dress, or a set of bed furniture, or a less quantity added to the starch used to stiffen them, renders them uninflammable, or at least so little combustible that they will not readily take fire; and if kindled, are slowly consumed without flame. None of the above-named salts are adapted for fine soft muslins, which mostly require chemical treatment, because they injure the texture, rendering the fabric harsh and destroying all its beauty. The salt which is found to answer most completely all the required conditions is *tungstate of soda*. Muslin steeped in a solution containing 20 % of this salt is perfectly non-inflammable when dry, and the saline film left on the surface is smooth and of a fatty appearance like talc, and therefore does not interfere with the process of ironing, but allows the hot iron to pass smoothly over the surface. The addition of a little phosphoric acid to the tungstate is recommended, for without this addition a portion of the tungstate is apt to undergo a chemical change and become comparatively insoluble. See ASBESTOS.

Income, a stipend; the receipts or gains derived from labor, business, or property of any kind; as from the produce of a farm; the rent of houses or land; the proceeds of literary or professional business; the profits of commerce or of occupation; the interest on funded property; or joint-stock securities. — *Gross Income* is the total amount or earnings and money from all sources accruing to the profit or use of a company, firm, etc, during a certain period, — usually one year. — *Net income* is obtained by subtracting from gross income all the expenses of the business, and the collected investments which form part of the receipts.

Incomings, receipts; money paid on entering upon a business, etc.

Inconvertible, not transmutable or changeable; some securities or investments are convertible into stock, etc.; others are not so.

Incrustation, a fur or sediment. — In building, work fixed with cement or cramp-irons into notches made to receive it.

Steam Boilers' I. With all qualities of water commonly used for feeding steam boilers there is a tendency to the production of hard calcareous deposits or layers of incrustation within the boilers, due to the separation of lime salts (particularly the carbonate and sulphate, or mixtures of these with a certain amount of carbonate of magnesia) as the direct consequence of the accumulation of these impurities from large quantities of water evaporated. The sparing solubility of the sulphate of lime (gypsum) in hot water fully accounts for its deposition in the boiler, and the carbonate of lime (chalk) is thrown down, not only as the result of direct evaporation, but by the ebullition expelling free carbonic acid, which holds this body to some extent in solution. Rain-water, which of itself is too pure to give rise to these incrustations, cannot be used *alone* for boiler purposes, for it has been found to exert a highly corrosive action upon the iron plates and fittings. It can, however, be advantageously employed in conjunction with "hard" spring or river waters, and has the effect of diminishing the incrustation merely as the result of dilution. The drain-pipes leading from the roof of the factory may be placed in connection with the tank or well from which the supply of water is drawn for the boilers. It will be seen hereafter that the selfsame remedy is efficient both as a means of preventing incrustation and obviating corrosion, and that by using one of the alkaline substances about to be specified this twofold advantage may be secured. Iron will not rust when immersed in water containing a mere trace of caustic alkali, and it is a common observation that the iron vessels used in the preparation of potash and soda remain for any length of time free from all appearance of rust. This singular property is, no doubt, susceptible of important applications; amongst them may be mentioned the better protection of iron ships from the attack of bilge water, of hydraulic rams, moulding boxes, smith's tools, and other objects liable to be placed at times under the influence of water. Some forms of surface condensers become quickly corroded in consequence of the purity of the water accumulating in them by the process of distillation, and a small dose of caustic alkali is then useful as a means of protection; the engine-cylinders also to some extent are preserved when alkaline anti-incrustation fluids are introduced into the boilers, for the minute quantity which is carried forward mechanically in the form of spray mixed with the steam, suffices to preserve the iron. Whilst a tendency to "priming" undoubtedly results from a too liberal use of soda or other alkali in the boiler, it will in practice be found easy to adjust the proportion of this ingredient, so as to secure immunity from corrosion and incrustation, and at the same time avoid the tumultuous kind of ebullition known as "priming." In all cases it is advisable to carry out a rigid system of inspection, and it is only in the way of saving fuel and labor that the application of boiler fluids is to be recommended. — Much benefit has often resulted from a coating of coal-tar or "dead oil" applied to the interior surfaces below the water line, when the boiler is opened for cleaning and inspection. These will tend very considerably to lessen the adhesion of calcareous crusts, and are not in any way affected by the boiler fluids in common use. Soda crystals and caustic soda may be used with great success in boilers to effect the immediate precipitation of the lime salts, and they act by throwing down a finely divided form of carbonate of lime, which in time furnishes nuclei for the deposition of subsequent accretions both of the carbonate and sulphate, so that they are prevented from crystallizing upon the walls of the boiler. A granular mud is thus formed, which subsides quickly and may be for the most part got rid of through the "blow-off cock," which should be opened for this purpose two or three times every day, and run out with as little water as possible.

The use of caustic soda has undergone a thorough trial in the boilers of the Royal Arsenal of Woolwich, England, and the following general instructions regarding its use are based upon an experience of upwards of ten years. The caustic soda should be dissolved in water so as to make a concentrated solution of sp. gr. 1.3. This, being perfectly miscible with water, may be introduced into the boiler with the feed-water at any time when, from the pressure of steam, it may not be convenient to pour it through the safety valve or other openings in the boiler. But when the steam is down there is no difficulty in introducing the prescribed dose by using a tin funnel with flattened aperture to pass it through the safety valve; or a tubular arrangement with double cocks will answer at all times. Half a gallon per diem is the average quantity found sufficient for a 20-horse stationary boiler, working with Thames water for ten hours daily. If the water should happen to be unusually hard a larger dose may be employed, but it would not be expedient to add in one charge more than the amount required for the day's consumption. Locomotive and multitubular boilers have been worked successfully with caustic soda, and it is here that the importance of using anti-incrustation fluids makes itself most apparent. — Many other methods have at various times been proposed to prevent the formation of deposits in steam boilers, for which consult a pamphlet on "Boiler Incrustation and Corrosion," by F. J. Rowan, published by Spon, London.

Incubator, a machine for hatching eggs by artificial heat.

Indebtedness, the state of being indebted.

Indelible, not to be blotted out; that cannot be effaced or lost; as an *I. ink* which, when used upon linen or muslin, cannot be obliterated by washing; an *I. color*, which does not fade or tarnish by exposure.

Indemnification, act of indemnifying; reimbursement of loss or damage.

Indemnity, security or exemption from damage, loss, or injury; thus a policy of insurance is a contract of *I.* against any particular loss. Where one person also becomes bail for another, a bond of *I.* is frequently executed; and where a bond or bill of exchange has been lost or mislaid, the acceptor or obligee would not act prudently in paying it, without being secured by a bond of *I.*

Indentation, a notch or mark cut in anything, — running in and out like a row of teeth.

Indenture, a writing or deed comprising some contract between two or more parties.

Index, an alphabetical table of reference to the contents of a book, or to the accounts of a ledger. — A pointer or needle which turns on a pivot. — The exponent of a power. — A directing post.

Index-Hands, the pointers of a clock, watch, or other registering machine.

India (British). The British Empire in India extends over a territory as large as the continent of Europe without Russia. It is situated between lat. 8° and 36° 30′ N., lon. 66° 30′ and 99° E.; and is bounded N. by Chinese Turkistan and Thibet, from which it is separated by the Himalaya mountains, E. by Burmah and Siam, and W. by Beloochistan and Afghanistan. The entire coast of the country E. of Cape Comorin, the southern extremity of the Peninsula, is washed

by the Bay of Bengal, while the S. W. coast extends along the Indian Ocean and the Arabian Sea From Peshawar, the northern frontier station, to Cape Comorin, the distance is 1,900 m, and the same distance separates Kurrachee, the port of Sinde, from Sudiya, the frontier-post on the eastern border of Assam. Geographically the country may be broadly divided into Northern and Southern India. Northern India, or Hindostan, lying at the foot of the Himalayas, and stretching from sea to sea, comprehends the rich alluvial plains watered by the Indus, the Ganges, the Lower Brahmaputra, and their tributaries. Southern India, or the Deccan, is a plateau of triangular shape and very old geological formation, bounded on two sides by the Malabar and Coromandel coasts, which converge at Cape Comorin, and on the third by the Vindhya Mountains, north of the Narbaddah River. Three fifths of this great empire are under the direct rule of the British government, and the remaining two fifths are made up of a large number of native states, which, according to the last official reports, exceed 450 in number. Various frontier countries, like Nepaul, merely acknowledge British superintendence, while others pay tributes or provide military contingents. New States are gradually drawn within the circle of British supremacy, either for the consolidation or the protection of the existing boundaries. The latest movement in this direction, toward the N. W., was the invasion of Afghanistan in 1879 The first general census of *B. I.* was taken during the years 1868 to 1876. The following table shows, according to the revised returns of this census, the area, population, and population by sq. m., of each of the divisions of India under British administration, and the total area and population of the feudatory States: —

Presidencies and Provinces under the Administration of—	Area in sq. miles.	Population.	Density of pop. to sq. mile.
The Gov.-Gen. of India: —			
Ajmere	2,711	396,889	146
Berar	17,728	2,226,496	126
Mysore	29,325	5,055,412	172
Coorg	2,000	168,312	84
Governors: —			
Madras	138,856	31,672,613	228
Bombay (including Sinde)	123,142	16,302,173	132
Lieutenant-Governors: —			
Bengal	156,200	60,502,897	383
Northwest Provinces	81,403	30,781,204	378
Punjab	104,975	17,611,498	168
Chief Commissioners: —			
Oude	23,992	11,220,232	468
Central Provinces	84,078	8,201,519	97
British Burmah	88,556	2,747,148	31
Assam	55,384	4,132,019	99
Total British Administration	908,350	191,018,412	210
Feudatory, or Native States	573,516	48,298,895	....
Total British India	1,481,866	239,317,307	....

The British-born population in India, exclusive of the army (which consists of about 60,000 men), amounted, according to the census taken in 1876, to 64,061 persons. Of these there were 38,946 of the male and 25,115 of the female sex. — The following table shows the number of Hindoos, Mohammedans, Buddhists, and Christians, in each of the provinces of India under British administration: —

Provinces.	Hindoos.	Moham'ns.	Buddhists	Christians
Bengal	38,975,418	19,553,831	84,974	90,763
Assam	2,679,507	1,104,601	1,521	1,947
N. W. Provinces	26,568,071	4,189,348	....	22,196
Ajmere	252,996	62,722	....	807
Oude	10,003,323	1,197,704	....	7,761
Punjab	6,125,460	9,337,685	36,190	22,154
Cent Provinces	5,879,772	233,247	36,569	10,477
Berar	1,912,155	154,951	....	903
Mysore	4,807,425	208,991	13,263	25,676
Coorg	154,476	11,304	112	2,410
British Burmah	36,658	99,846	2,447,831	52,299
Madras	28,863,978	1,857,857	21,254	533,760
Bombay	12,989,329	2,870,450	191,137	126,063
Total	139,248,568	40,882,537	2,832,851	897,216

The term "Presidency," which is applied to the provinces or governments of Bengal, Madras, and Bombay, is no longer a correct one, and in the case of Bengal is positively misleading. The expression is a relic of the time when the three settlements of Fort William, Fort St. George, and Bombay were each under the authority of a president, and comprised nearly the whole of the British possessions in India. Its use now frequently leads to the mistaken notion that British India still consists of three presidencies, whereas it is divided into provinces, each under its own civil government, and each independent of the others, but subordinate to the supreme government.

The present form of government of the Indian Empire is established by the Act 21 and 22 Victoriæ, cap. 106, called "An Act for the better Government of India," sanctioned Aug. 2, 1858 By the terms of this act, all the territories heretofore under the government of the East India Company are vested in the British sovereign, and all its powers are exercised in his name; all territorial and other revenues, and all tributes and other payments, are likewise received in his name, and disposed of for the purposes of the government of India alone, subject to the provisions of this act. One of the queen's principal secretaries of state, called the Secretary of State for India, is invested with all the powers hitherto exercised by the company or by the board of control. By Act 39 and 40 Victoriæ, cap. 10, proclaimed at Delhi, before all the princes and high dignitaries of India, Jan. 1, 1877, the Queen of Great Britain and Ireland assumed the additional title of *Indiæ Imperatrix*, or Empress of India. The executive authority in India is vested in a Governor-General or Viceroy, appointed by the Crown, and acting under the orders of the Secretary of State for India. The Governor-General, assisted by a Council of six members, has power to make laws for all persons, whether British or native, foreigners or others, within the Indian provinces, and for all subjects of the Crown within the dominions of the feudatory territories. Calcutta is the seat of government, and the residence of the Governor-General.

The occupations of the adult male population of *B. I.*, calculated to number 57,508,150, were classified as follows at the last enumeration: —

Classes.	Number of adult males
Government service and professions	2,404,555
Domestic occupations	4,137,429
Agriculture	37,402,220
Commerce	3,440,951
Industrial occupations	8,746,503
Laborers	8,174,600
Independent and non-productive persons	2,264,858
Total adult male population	57,508,150

In 1879 there were in *B. I.* 44 towns with over 50,000 inhabitants, as follows: —

Towns.	Pop.	Towns.	Pop.
Calcutta (with suburbs)........ ..	794,645	Shahjehanpoor	72,136
Bombay	644,405	Bhaugulpoor	69,678
Madras........	397,552	Dacca..............	69,212
Lucknow...........	284,779	Mirzapoor..........	67,274
Benares............	175,188	Gya................	66,843
Patna	158,900	Moradabad	62,417
Delhi	154.417	Monghyr...........	59,698
Agra...............	149,008	Muttra.............	59,281
Allahabad..........	143,693	Peshawur..........	58,555
Bangalore..........	142,513	Allyghur...........	58,539
Umritsur...........	135,813	Mysore.............	57,815
Cawnpoor..........	122,770	Mooltan	56.826
Poona	118,886	Jubbulpoor	55,188
Ahmedabad........	116,873	Kurrachee..........	53,526
Surat..............	107,149	Sholapoor	53,403
Bareilly............	102,982	Tanjore	52,175
Lahore.............	98,924	Madura............	51.987
Rangoon	98,745	Bellary	51,766
Howrah	97,784	Goruckpoor........	51,117
Nagpoor...........	84,441	Cuttack	50,878
Meerut.............	81,386	Salem	50,012
Furruckabad.......	79,204	Total pop. of the 44 largest towns	5,594,913
Trichinopoly	76,530		

The *geographical features* of India are distinguished at once by their grandeur and their variety. It is, as it were, an epitome of the whole world. Its vast plains present the double harvest, the luxuriant foliage, and even the burning deserts of the torrid zone; the lower heights are enriched by the fruits and grains of the temperate climate; the upper steeps of the Himalayas are clothed with the vast pine forests of the north; while the highest pinnacles are buried beneath the perpetual snows of the arctic zone. The main body, as it were, of India, the chief scene of her matchless fertility, is composed of a plain, extending along the entire breadth from E. to W., between the Brahmapootra and the Indus, and reaching in point of latitude from the great chain of the Himalayas to the high table-land of the Southern Peninsula. It thus possesses a length of about 1,500 m., with an average breadth of from 300 to 400. With the exception, perhaps, of the country watered by the great river of China, it may be considered the finest and most fertile on the face of the earth. Of this general character of the Indian plain the province of Bengal presents the most complete and striking example, — no part of it being diversified with a single rock or even a hillock. The Ganges pours through it a continually widening stream, which, during the rainy season, covers a great extent with its fertilizing inundation. From this deep, rich, well-watered soil the sun awakens an almost unrivalled power of vegetation, and makes it one entire field of waving grain. Bahar, further up the current, has the same general aspect, though its surface is varied by some slight elevations; but Allahabad, higher still, is mostly low, warm, and fruitful, exactly like Bengal. North of the river the provinces of Oude and Rohilcund, sloping gradually upwards to the mountains, enjoy a more cool and salubrious climate, and display in profusion the most valuable products both of Asia and Europe Here the valley of the Ganges terminates, and is succeeded by that of the Jumna, more elevated, and neither so well watered nor quite so fertile. The Doab, or territory between the two rivers, requires in many places artificial irrigation. Its woods, however, are more luxuriant; while the moderate cold of its winter permits a crop of wheat or other European grain to be raised, and the summer is sufficiently hot to ripen one of rice. To the S. of the Jumna, and along the course of its tributary the Chumbul, the ground is broken by eminences, extending from the hills of Malwa and Ajmere; while, even amid its most level tracts, insulated rocks, with perpendicular sides and level summits, form those almost impregnable hill-forts, so much celebrated in Indian history. Westward of Delhi begins the Great Desert, — a sandy tract which intervenes between the tributaries of the Ganges on the one side and the Indus and its tributaries on the other, and which is refreshed only by a few small rivulets that spring up and disappear amid the waste. This entire region, about 600 m. long and 300 broad, presents an aspect nearly similar to the most dreary parts of Arabia and Africa. To the N. and N. W. of this barren tract, however, lies the plain of the Punjaub, where the five tributaries of the Indus, rolling their ample streams, produce a degree of fertility equal to that of the region watered by the Ganges. High cultivation, too frequently obstructed by public disorders, is alone wanting to make it rival the finest portions of the more eastern territory. Throughout nearly the whole of this vast plain the wants of the population and the demands of commerce have superseded the original productions of nature: and, even under the most careful management, few of those exquisite shrubs are now reared which have given such celebrity to the vegetable kingdom of the East. Its staples consist of solid, rich, useful articles, produced by strong heat acting on a deep, moist, and fertile soil, — as rice, the Eastern staff of life, sugar, opium, indigo, and, in the drier tracts, cotton. Such an entire subjection to the plough and the spade, joined to the want of variety in the surface, gives to this great central region a tame and monotonous aspect The Deccan, or Southern Peninsula, presents none of those singular features which distinguish the great central plain and its northern boundary. Hills, occasionally rising to the rank of mountains, and enclosing tablelands of various elevations, diversify its surface, and procure

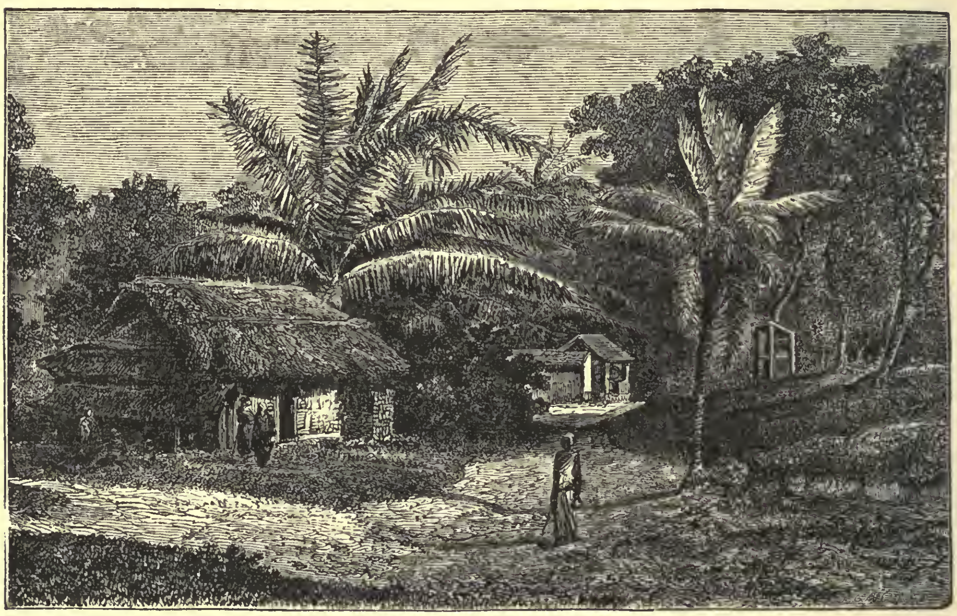

Fig. 283 — Indian Cottage.

for it at once the climate and vegetation of the tropical and of the temperate zones. But the most prominent feature is a range of heights, corresponding to the triangular form of this part of the continent. The N. border consists of the Vyndhya chain, — a tract of high country stretching from the Gulf of Cambay to the Bay of Bengal, chiefly along both banks of the Nerbuddah, and composing the districts of Malwa, Candeish, and Gundwana, to which has been given the name of Central India From its extremities extend southward the Ghauts, two parallel chains, which, at a greater or less distance, girdle the whole of the opposite coasts of Malabar and Coromandel The Western Ghauts, rising from about 3,000 feet in the N. to 6,000 feet in the S , stand generally at a small distance from the sea. The chief productions of this district, which includes a great part of the Bombay presidency, are the pepper, vine, betel, and the areca, sago, and cocoa palms ; while the highest tracts are crowned by forests of teak. At the boundary of Mysore there crosses the continent a ridge, called the Nhilgerries. the loftiest in all this part of India, having one peak 8,700 feet in height, which has lately become an important sanitary retreat. Farther S., the W. coast is in general very low, and traversed by numerous streams flowing parallel to the shore, thus affording great convenience for inland navigation. The Eastern Ghauts, rising behind the Coromandel coast, and including a considerable portion of the Madras presidency, are generally less elevated, but spread into more numerous branches, and over a wider surface. They leave also a broader plain between them and the sea ; yet, unless in the deltas of the great rivers which, from the W., cross the Ghauts and fall into the Bay of Bengal, this space bears somewhat of a naked and arid character. There occur even extensive tracts of sandy soil impregnated with saline substances, which in some degree taint the atmosphere. More to the N. in Orissa and the Circars, the high grounds often advance close to the sea, and consist to a great extent of mountain and jungle, continuing in a more uncultivated state, and peopled by more uncivilized races than almost any other part of India. Cuttack, again, a district approaching the Ganges, is so low as to be liable to frequent inundations from the sea. — These three ranges enclose a table-land, nearly 2,000 feet above the level of the ocean, and comprising the main body of Southern India. The S. W. tract. the original seat of Mahratta power, forms a hilly country ; but the central region, composing the once powerful kingdom of Golconda and Bejapore, comprehends extensive fertile plains, secured by their elevation from the scorching heats which afflict the territory along the coast. The extreme southern district, called the Carnatic, is divided into two table-lands, the Ballaghaut and the Mysore, considerably higher than those of the Deccan, and on that account including a greater variety of climate, soil, and production.

Of the rivers, the largest have their source in the great northern chain of the Himalayas ; and the rest, with few exceptions, in the table-land of Central and Southern India, which is supported by the Ghauts. The principal rivers, with the length of their respective course to the sea, are : Indus, 1,700 m.; Brahmaputra, 1,900 m ; Ganges, 1,500 m.; Jumna (to its junction with the Ganges, 780), 1,500 m.; Sutlege (to the Indus, 900), 1,490 m.; Guylum (to the Indus, 750), 1,250 m.; Gunduck (to the Ganges, 450), 980 m. In the Deccan, the Godavery, 850 m.; Kistna, 700 m.; Nerbuddah, 700 m.; Mahanuddy, 550 m.; Tuptee, 460 m.; and Cavery, 400 m. There are few coasts of such extent so destitute of islands and harbors as that of *B. I.* With the exception of emerged sea-banks and mere rocks, Ceylon is the only island near its shores ; and on the E. coast, Masulipatam, which admits vessels of 300 tons burden, is the only harbor for large vessels between Trincomalee, in the island of Ceylon, and the Ganges, which is free from raging surf. To this inconvenience Madras, though an important port, is peculiarly liable On the W. coast, the only harbors capable of admitting large vessels are Bombay and Kurrachee, in Scindo, Mangalore admits no vessels drawing more than 10 feet water.

Climate. *B. I.* comprehends within its bounds the opposite extremes of heat and cold. The plains are burnt up with intense heat; while winter, with every intermediate variety of temperature, prevails in the mountains. Philosophers have in vain endeavored to fix the point of perpetual congelation under different degrees of latitude. They have, indeed, framed a graduated scale of the respective heights at which, according to calculation, this point should begin at corresponding distances from the equator ; but theory is here at variance with actual observation. The climate of mountainous tracts depends so much on localities, and the particular course of the winds, as to baffle all general speculation. Hence, on the Himalaya Mountains harvests of grain are found, where, according to hypothesis, the ground should be buried under deep snow ; and trees are seen to flourish in the regions of perpetual winter. In northern Hindostan great and sudden changes of temperature occur, which is the cause of pulmonary affections During summer the thermometer, which is often in the morning at 32° or under it, rises to 70°, 75°, and 80°, or upward, during the day ; the winters are, however, uniformly severe. In this, also, as in other hilly countries, the traveller may be fainting to-day under a tropical sun, and shivering to-morrow amid the rigor of perpetual snows. From the banks of the Sutlege, where the thermometer frequently stands at 100° and 108°, three days' climbing will carry him into the regions of winter. In the plains of Hindostan the heat during the greater part of the year is unintermitting and intense, except where it is modified by the ranges of mountains, or the table-lands towards the west The seasons here are commonly divided into the hot, cold, and rainy. The spring and the dry season throughout the valley of the Ganges last about four months, the heat gradually increasing with the season, until, in May and June, the thermometer rises to 100° and frequently, in the interior, to 108° and 110°, when it is almost intolerable even to the natives, and still more so to Europeans, who resort to various modes of alleviation, such as the *cuscus tatty*, which is a frame of wood interwoven with twigs, between which is distributed a layer of a particular kind of sweet-scented grass. This being hung before an open window, in the quarter of the prevailing wind, and constantly moistened on the outside by a water-carrier, diffuses a refreshing coolness.

Vegetable Produce. *B. I.* comprehends all the known varieties of the vegetable tribes. The mountainous tracts of N. Hindostan produce all the Alpine plants and the various species of European grain, fruits, and flowers. Deep woods cover those lower ranges of mountains, in which are found the pine-tree of various species, the larch, the silver, and the spruce-fir, from the bark and twigs of which resin exudes in abundance ; the yew-tree, several species of oak, holly, alder, sycamore, and birch, with mulberry and chestnut trees. These noble forests extend over immense tracts, and would afford inexhaustible supplies of timber if they could be transported to the proper market. Fruits in great variety are also produced in this elevated region, such as apricots, peaches, and grapes, apples, pears, currants, raspberries, blackberries, and strawberries ; roots, such as turnips, carrots, garlic, and onions ; flowers and plants, as roses, both red and white. lilies of the valley, jasmines, buttercups, yellow, blue, and white cowslips, and sweet-brier, with numerous other beautiful and fragrant plants. The valleys exhibit, according to their altitude and temperature, the productions of Europe or of the tropical countries. At the height of 6,000 feet appear the oak and the pine ; at that of 3,000 feet rattans and bamboos of enormous dimensions ; in some parts the pine-apple, the orange, and the sugar-cane grow to maturity ; in others, barley, millet, and similar grains are produced. The lower valleys yield rice, sown broadcast, maize, wheat, barley, pulse of various kinds, sugar-cane, cotton, Indian madder, a large species of cardamom, besides other productions The pastoral tribes of Northern Hindostan feed considerable flocks on the lower hills and valleys ; in summer they climb the Alpine country, and browse on the herbage adjacent to the region of perpetual frost. — Rice is the great staple of agriculture throughout Hindostan, in the plain of the Ganges as well as in S India It is sown at the approach of the rains, and it is gathered during the rainy season, about the end of August ; the last crop is sown during the same season, and is gathered in the beginning of December. It is esteemed the best, not being equally liable with the other to decay The diversity of soil and climate, and the several seasons of cultivation, have given rise to infinite varieties in this species of grain. When the rains fail throughout Hindostan, which occasionally happens, the rice crops are apt to be deficient to a degree altogether unknown in the well-regulated agriculture of Europe, where the severest scarcity hardly ever increases the price of corn more than three times its usual rate. But the famines of Hindostan leave thousands without subsistence, and fill the land with scenes of misery and death. Other kinds of grain are cultivated, such as Indian corn ; and great varieties of pulse and coarse grains, such as pease, beans, chiches, gram, vetches, and raggy, which is the most important crop raised in the dry field, and in some parts of S. India is the subsistence of all classes, in others of the poorer classes. These are important articles of cultivation, as they have each their particular season, and thrive even on poorer soils. Maize is the general produce of poor soils in hilly countries, and is commonly cultivated in the more western provinces. Millet and other grains are also cultivated, and, vegetating rapidly, in every season they fill up profitably for the farmer the short intervals between the other modes of cultivation in lower Hindostan. Sugar is everywhere cultivated, and at little expense by the Hindoo cultivator ; it grows luxuriantly throughout all the valleys of the Ganges, and in the plains of S. India, and could be produced, with the help of European skill, to meet any demand Opium, which is a government monopoly, is extensively cultivated in many parts of Hindostan. It is a precarious crop, producing alternately high profits and heavy losses. The cotton plant has from time immemorial been one of the staple products of Hindostan, and is indigenous from Ceylon in the S to the Himalaya Mountains. It is cultivated extensively, raised in the Doab and others of the upper Gangetic provinces, from which Bengal is almost entirely supplied ; but the best qualities are found in the Nagpore district, and in the vicinity of Surat and Bombay. These, however, have continued to be inferior to the American, as they are frequently rendered unmarketable by their foul state, being mingled with dirt and seed. Great exertions have been made by the government to im-

prove the quality; experimental farms have been established; seeds of the American and Egyptian species have been introduced, also cleaning implements, particularly our saw-gin. Its application appeared at first completely successful; but it was soon found that it shortened the staple. It appears on the whole, however, that European superintendence, with an improvement in the native modes of cleaning and packing, has of late raised the value. Silk is another material native to India; and, though its actual culture is not so widely diffused as that of cotton, it could probably be produced in almost any desired quantity. Cossimbuzar, Commercolly, and Rungpore are at present the principal districts whence it is derived. Tobacco has been planted by Europeans, and is in general use. The chief other products are: indigo, extensively grown along the alluvial tracts of Bengal, bordering on the Ganges; pepper, raised amid the wooded hills of Malabar and Canara; saltpetre, an article of which Bengal, from some peculiarity in its soil and climate, enjoys nearly a monopoly; and wool, which was always produced, though, till lately, of very inferior quality In the territory of Bombay it has been remarkably improved.

Minerals. Coal, iron, and salt are the most important and abundant mineral products. The principal coal-fields are in the valley of the river Dammooda, N. W. of Calcutta, where they occupy an area of 1,500 sq. m. Iron is widely distributed throughout the country; and salt is procured in immense quantities and of remarkable purity from the salt range of the Punjaub. Gold is found in the gravel of streams, but only in small quantities. Lead is obtained from the N. W. Himalaya districts, and there is a considerable yield of copper in Gurwhal, Nepaul, and Sikkim, and near Singbhoom in Bengal. Antimony occurs abundantly in N. India; there are valuable tin-mines in British Burmah, and petroleum has been discovered in the Pegu district of that province. Among the gems found in India are the diamond, ruby, topaz, beryl, carnelian, and garnet.

Manufactures. The Indian manuf. have enjoyed a high reputation from the earliest antiquity. The country containing a great number of inhabitants who are extremely poor, and a few who are immensely rich, a demand is created on the one hand for a great mass of coarse fabrics, and on the other for a small quantity that are exquisitely fine. To exhibit themselves in splendid robes is a favorite object of Oriental luxury; accordingly, the produce of the loom had reached a perfection to which that of no other country, except Britain, and that very recently, could make even an approach. The delicate and flexible form of the Hindoo, the pliancy of his fingers, and the exquisite sense with which they are endowed, even his quiet indefatigable perseverance, all render him peculiarly fitted for this description of employment. The muslins of Dacca in fineness, the calicoes and other piece goods of Coromandel in brilliant, durable colors, have never been surpassed; and yet they are produced without capital, machinery, division of labor, or any of those means which give such facilities to the manufacturing skill of Europe, — the weaver being merely a detached individual, with a loom of the rudest construction, consisting sometimes of a few branches of trees or bars of wood roughly put together. The demand for these fine muslins and calicoes, however, has within the last fifty years greatly decreased, owing partly to the fall of so many splendid courts where alone remunerating prices could be obtained, but mainly to the competition of the cheap imitations of these fabrics, which are imported from Manchester, Glasgow, and Paisley. The only cloths that now meet a sure sale are those coarse cotton robes woven in almost every inland village, for the use of the common people. The sole other manufacture deserving of notice is that of silk, which is also of great antiquity in India, and carried to considerable perfection, though not nearly equal to that of cotton. Bandanas and other handkerchiefs, crapes and taffetas, are the forms in which it is chiefly produced. The shawls of Cashmere are also highly prized in every quarter of the world.

Inland Trade comprehends not only the intercourse between the British Provinces, and the trade of the latter with the tributary States, but also the trade along a land frontier of about 2,000 m. with Afghanistan, Turkistan, and Thibet. This trade is very great, and has been vastly developed of late years by the construction of several great lines of railroads; but there are only meagre statistics concerning it.

Foreign Trade. From the reputed wealth and precious produce of India, foreign nations were always desirous to participate in its trade. Prior to Alexander's expedition to the East it was scarcely known to the Greeks, nor is it certain that they had ever seen its productions. But we know that these were brought to Rome, especially silk, which so allured the vanity of the Roman ladies that it sold for its weight in gold. Other valuable commodities of India, such as calicoes, muslins, aromatics, ivory, diamonds, pearls, and other gems, precious aromatics, the pepper of Malabar, turtle shell, etc., and some dry sugar and indigo, were also imported into Alexandria, the chief emporium of eastern commerce, and were naturally attracted to the great metropolis of the ancient world. This trade was carried on from Myos Hormos, the chief port on the Red Sea, whence, after the conquest of Egypt by the Romans, the annual fleets, sometimes of 120 vessels, set sail, and, under the propitious influence of the S. W. monsoon, boldly stretched across the Indian Ocean for the western coast of Hindostan, which they reached in about 40 days: and afterward extended their voyage round Cape Comorin to the coast of Coromandel and the mouths of the Ganges. The high price received for these eastern luxuries in Rome encouraged the merchants to provide larger vessels, and a band of archers to defend them against the pirates, who then, and until very lately that they were extirpated by British ships of war, infested the western shores of India. The commodities of the East, being landed at Myos Hermos, were carried on camels to Coptos, the seat of a flourishing trade, and thence by sea to the Nile, whence they reached Alexandria by water carriage, and were reshipped to the different ports on the Mediterranean. The produce of India was also brought to Europe by other routes, — namely, by the way of Palmyra, then a flourishing city, and thence to Rome and other western countries, through the ports of Syria. But though there was a demand in Europe for the produce of India, there was no demand in India for the produce of Europe; and bullion was the only article that could be sent out in exchange. The annual drain of gold from Rome and its provinces for Indian goods was estimated by Pliny at 500 sestertia, equal to about $2,000,000. In the convulsions which followed the decline of the Roman Empire, the trade of the East was successively engrossed by the Persians and Arabians. The latter, in the year 636, built the city of Bassora, which soon grew into a great commercial mart; and to this place, and to Ormuz, long celebrated for its vast riches and its trade, the spiceries and merchandise of India were brought and distributed through the various ports of the Mediterranean. After the expulsion of the crusaders from Syria and Egypt, Alexandria again became the chief entrepôt of eastern produce, whence it was carried to Italy by the Venetians and others, and distributed throughout Europe. But the discovery of a passage to India in 1495 by the Cape of Good Hope changed the course of this trade, which now entirely left the Italians, and was engrossed by the Portuguese for nearly a century without any molestation from European rivals. At length the Dutch and the English became their competitors, and established joint-stock companies, with the exclusive privilege of the eastern trade. But their anticipations of profit were not realized. The great distance of Europe from India, and the want of an equivalent for its produce, precluded any extensive intercourse; the trade accordingly bore a very small proportion to the trade of the country; and being besides cramped by monopolies, it never attained its natural growth. The commerce of nations is limited to the surplus produce which they can mutually exchange; and, from the great distance between India and Europe, this surplus produce was long confined to those few articles which, containing a great value in small bulk, could bear the expense of a long voyage. The demand was also altogether on the side of Europe. and its trade with India consisted merely in the purchase, with bullion, of a small quantity of precious articles for the consumption of the rich. The progressive improvement of industry in Europe, together with the entire opening of the trade to India and China since the year 1834, has occasioned not only a greater exportation of British goods, but a change also in the nature of the trade. It is not so much the produce of the labor as of the climate and soil of India, which no ingenuity can supply, that is in demand in Great Britain; and, accordingly, while the import of Indian manufactures has fallen off, that of the raw material, and many varieties of vegetable produce, has increased. Thus, in the progress of the trade between India and Europe, the former country, notwithstanding its boasted wealth and superior industry, has taken the lowest place, exporting her rude produce for the manufactures of the richer country; and so prodigious have been the improvements in European manufactures, that the raw material of cotton, being exported from India to England. and manufactured there, was, and is still, to a certain extent, re-exported and sold at a cheaper rate than the home fabrics, though loaded with the expense of a double voyage across half the globe. The total value of the imports and exports of *E. I.* was as follows in each of the ten years from 1868 to 1877: —

Years.	Imports.		Exports.	
	Merchandise.	Bullion and Coin.	Merchandise.	Bullion and Coin.
	£	£	£	£
1868......	35,705,783	11,775,374	50,874,056	1,571,946
1869......	35,990,142	15,155,954	53,062,165	1,395,580
1870......	32,927,520	13,954,807	52,471,376	1,042,353
1871......	34,469,119	5,444,823	55,336,186	2,220,765
1872......	32,091,850	11,573,813	63,189,732	1,495,642
1873......	31,874,625	4,556,515	55,231,463	1,308,579
1874......	33,836,028	5,792,534	54,981,561	1,958,512
1875......	36,222,087	8,141,047	56,359,230	1,625,309
1876......	38,887,340	5,300,722	58,091,495	2,200,236
1877......	37,440,631	11,436,120	61,013,891	4,029,858

About 50 per cent of the imports and exports come from and go to Great Britain. The chief articles of British produce im-

ported to India are cotton goods and iron. The most important articles of export from India to Great Britain are raw cotton, jute, rice, flax and linseed, tea, and untanned hides. The quantities, and still more the value of the exports of raw cotton are gradually decreasing. The following table exhibits

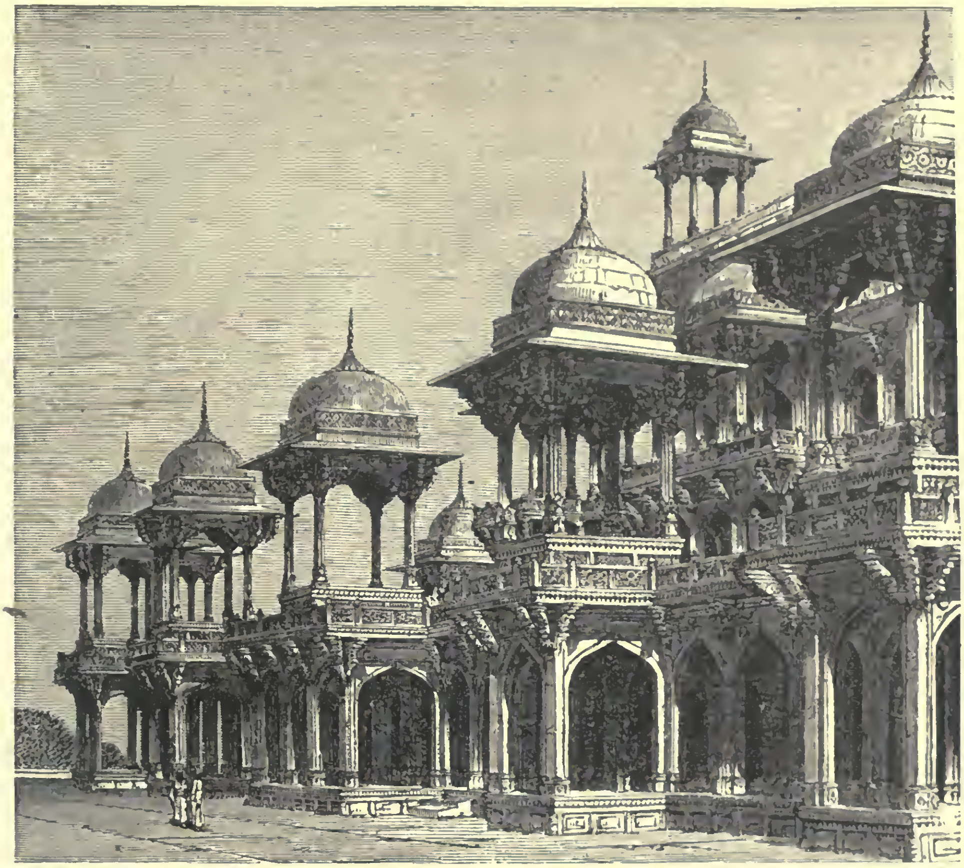

Fig. 284. — THE MAUSOLEUM OF AKBAR, NEAR AGRA.

the quantities and value of raw cotton exported from India to Great Britain in each of the ten years from 18_8 to 1877 : —

Years.	Quantities.	Value.
	Cwt.	£
1868	4,398,119	15,975,568
1869	4,284,334	18,342,887
1870	3,041,165	9,434,674
1871	3,843,491	11,711,349
1872	3 934,546	12,862,300
1873	3,278,986	9,812,086
1874	3,668,928	10,325,630
1875	3,413,546	9,173,275
1876	2,448,738	5,874,704
1877	1,725,582	4,230,803

The flow of the precious metals into India has for ages been a remarkable feature of the commerce of that country; it is yet very large, though it has been greatly on the decrease in recent years.

From 1835 to 1875 the value of merchandise exported from India was about 1200 millions sterling, against 700 millions of imports. To meet this balance in favor of India, the treasure imported was £313,331,593 ($1,716,657,965), against £43,618,669 ($218,093,345), exported; £162,063,824 ($810,319,120) were remitted to India by bills of exchange drawn in England, leaving a balance of about 38 millions.

Next to Great Britain, the countries having the largest trade with India are, in order of importance, China, the Straits settlements, Ceylon, France, and the U. States.

The commerce of the U. States with *B. I.*, principally confined to the ports of Calcutta and Bombay, was as follows for the 20 consecutive years from 1859 to 1878 : —

Years.	Exports from the U. States to *B. I.*		Imports from *B. I.* to the U. States.	Total Imports and Exports.
	Domestic.	Foreign.		
	$	$	$	$
1859	1,231,893	131,722	8,697,229	10,060,844
1860	1,111,697	128,953	10,692,342	11,932,992
1861	604,511	25,390	8,745,768	9,375,669
1862	412,924	92,398	3,066,952	3,572,274
1863	594,920	55,741	5,416,699	6,067,360
1864	670,208	20,575	5,293,814	5,984,597
1865	652,527	4,540	1,619,827	5,276,894
1866	581,968	850	6,181,668	6,764,486
1867	381,141	17,779	8,932,485	9,331,405
1868	642,531	4,909	7,476,294	8,123,734
1869	471,019	11,485	9,003,710	9,486,214
1870	239,089	4,559	10,050,834	10,294,482
1871	273,513	31,020	13,702,787	14,007,320
1872	426,382	4,925	11,242,697	11,674,004
1873	165,270	3 906	16,855,747	17,024,923
1874	482,998	10,464	14,179,664	14,673,126
1875	473,049	....	15,584,099	16,057,148
1876	356,564	7 571	12,809,937	13,174,072
1877	862,620	3,020	10,725,619	11,591,259
1878	939,348	1,843	12,081,595	13,022,786
Total	11,574,172	561,650	195,359,767	207,495,589

The value of the principal articles imported from and exported to the U. States, for the year 1878, was as follows: —

Imports: Indian corn, $13,050; cotton goods, $78,841; drugs, etc., $10,820; fruits preserved in cans, $5,995; silver bullion, $52,350; ice, $87,470; naval stores, $18,571; mineral oil, $532,137; lard, $7,500; soap, $5,490; spirits of turpentine, $42,046; tobacco, $29,131. — *Exports:* Chemicals, dyes, etc. (entry free), $238,026; coffee (1,269,557 lbs.), $196,925; catechu (24,298,310 lbs.), $960,437; gums, $318,647; hides and skins, $2,039,144; india-rubber, $100,397; indigo, $825,099; fixed oils, $63,917; volatile oils, $33,077; rags, $29,623; tin in bars, $807,103; woods (unmanuf.), $98,335; flax (manuf. of), $73,956; jute (raw), $1,538,298; jute (manuf. of), $502,349; leather, $109,047; saltpetre, $276,732; linseed (1,290,269 lbs.), $1,882,953; spices, $785,617; brown sugar (16,194,232 lbs.), $726,997.

In 1878, 22 American vessels (tonnage 24,072) entered, and 24 (tonnage 26,169) cleared, the ports of *B. I.*; 69 foreign vessels for *B. I.* (tonnage 70,599) entered, and 4 (tonnage 2,572) cleared, the ports of the U. States.

Finances. The revenue and expenditure of the Indian Empire are subjected to the control of the Secretary in Council, and no grant or appropriation of any part of the revenue can be made without the concurrence of a majority of the Council. Such parts of the revenues of India as may be remitted to England, and moneys arising in Great Britain, must be paid into the Bank of England; and paid out on drafts or orders signed by three members of the Council, and countersigned by the secretary or one of his under secretaries. The subjoined table gives the total gross amount of the actual revenue and expenditure of India, in each of the ten fiscal years, ending March 31, from 1868 to 1877.

Years.	Revenue.	Expenditure.		Total Expenditure.
		In India.	In Great Britain.	
	£	£	£	£
1868	48,534,412	41,044,485	8,497,622	49,542,107
1869	49,262,691	42,207,629	9,829,092	52,036,721
1870	50,901,081	41,363,021	9,419,391	50,782,412
1871	51,413,686	39,899,435	10,031,261	49,930,696
1872	50,110,215	37,282,803	9,703,235	46,986,038
1873	50,219,489	38,205,212	10,248,605	48,453,817
1874	49,598,253	42,094,995	9,310,926	51,405,921
1875	50,570,171	40,760,583	9,490,391	50,250,974
1876	51,310,063	40,486,068	9,155,050	49,641,118
1877	55,955,785	44,710,800	13,467,763	58,178,563

The most important source of public revenue to which rulers in India have, in all ages, looked for obtaining their income is the land, the revenue from which, in the year before the Mutiny, furnished more than one half of the total receipts of the East India Company's treasury. At present, when the necessities of the Indian exchequer require that government should resort more largely to the aid of duties levied on the continually increasing trade of the country, the revenue from land produces not quite so much in proportion, but it still forms two fifths of the total receipts of the Empire. Next in importance to the land-revenue, as a great source of Indian receipts, is the income derived from the *opium monopoly.* The cultivation of the poppy is prohibited in Bengal, except for the purpose of selling the juice to the officers of the government at a certain fixed price. It is manufactured into opium at the government factories at Patna and Ghazipore, and then sent to Calcutta, and sold by auction to merchants who export it to China. In the Bombay presidency the revenue is derived from the opium which is manufactured in the native states of Malwa and Gujerat, on which passes are given, at the price of £60 per chest, weighing 140 lbs. net, to merchants who wish to send opium to the port of Bombay. The poppy is not cultivated in the presidency of Madras. The gross revenue derived from opium averaged during the ten years from 1867 to 1876 the sum of eight millions sterling.

The amount of the *public debt* of India, including that incurred in Great Britain, and treasury notes, etc., in 1878, was £138,935,025 ($694,675,125). The total interest on debt and obligations amounted to £4,907,236 ($24,536,180).

The *currency* of India is chiefly silver, and the amount of money coined annually is large. On July 16, 1861, an act was passed by the government of India, providing for the issue of a paper currency through a government department of Public Issue, by means of promissory notes. Circles of issue were established from time to time, as found necessary, and the notes were made legal tender within the circle in which they were issued, and rendered payable at the place of issue, and also at the capital city of the presidency within which that place was situated. Under the provisions of further laws, consolidated by a statute known as Act III. of 1871, the issue was regulated in seven descriptions of notes, namely, for 10,000 rupees, or £1,000; for 1,000 rupees, or £100; for 500 rupees, £50; for 100 rupees, or £10; for 50 rupees, or £5; for 20 rupees, or £2; for 10 rupees, or £1, and for 5 rupees, or 10*s.* In 1878 the total amount of notes in circulation was £11,641,654 ($58,208,270).

Railroads. In the year 1845 two great private associations were formed for the purpose of constructing lines of railroad in India; but the projectors found it impossible to raise the necessary funds for their proposed schemes without the assistance of the State. It was therefore determined by the Indian government to guarantee to the railway companies, for a term of 99 years, a rate of interest of 5 per cent upon the capital subscribed for their undertakings; and, in order to guard against the evil effects of failure on the part of the companies, power was reserved by the government to supervise and control their proceedings by means of an official director. The lands are given by the government free of expense, and the stipulated rate of interest is guaranteed to the shareholders in every case, except that of the traffic receipts of the line being insufficient to cover the working expenses, in which event the deficiency is chargeable against the guaranteed interest. Should the net receipts be in excess of the sum required to pay the guaranty, the surplus is divided in equal parts between the government and the shareholders, until the charge to the government for interest in previous years, with simple interest thereon, has been repaid, after which time the whole of the receipts are distributed among the shareholders. The government has the power, at the expiration of a period of 25 or 50 years from the date of the contracts, of purchasing the railways at the mean value of the shares for the three previous years, or of paying a proportionate annuity until the end of the 99 years, when the whole of the lands and works will revert from the companies to the government. In 1869 the government of India decided on carrying out all the new railway extensions by means of direct State agency, that is, without the intervention of guaranteed companies.

The following table shows the length of the various lines of railroad open for traffic, and in course of construction, in 1878: —

Railroads.	Open for traffic, 1878.	Total open or under construct.
Guaranteed.	Miles.	Miles.
E. Indian, including Jabbalpoor branch	1,503	1,503
Eastern Bengal	159	159
Oude and Rohilkund	544	712
Sinde, Punjab, and Delhi	664	664
Great Indian Peninsula	1,280	1,280
Bombay, Baroda, and Central India	422	422
Madras	858	858
South Indian	600	617
Total, guaranteed lines	6,029	6,215
State.		
Calcutta and Southeastern	28	28
Nalhati	27	27
Khamgaon and Amraoti	14	14
Rajputana	400	400
Patri branch of Bombay and Baroda line	22	22
Wardha Valley	46	46
Tirhut	79	367
Punjab Northern	103	427
Muttra and Hathras	30	30
Northern Bengal	134	261
Indore to Neemuch	37	304
Indore to Khandwa (Holkar)	71	86
Rangoon and Irawaddy Valley	163	205
Rajputana	400	400
Wadi to Hyderabad (Nizam's)	121	121
Gaekwar of Baroda's	20	55
Total, State lines	1,295	2,394
Total, Indian railroads	7,324	8,609

The number of passengers carried on the railroads of India largely increased in the course of 10 years, rising from 16,875,978 in 1869, to 36,711,514 in 1878. According to an official report for the same year, the total outlay upon railroads, both State and guaranteed, amounted to £110,005,044 ($550,025,220) at the end of 1878.

Money: —

	£	s.	d.
The *Mohur* of Bengal, average rate of exchange	1	13	6¾
" *Mohur* of Bombay " "	1	10	1¼
" *Rupee* of Bombay " "	1	9	2¼
" *Rupee* of Madras of 15 silver *Rupees* "	1	9	2¼
" *Star Pagoda* of Madras "	0	7	4¾
" Madras or Company's *Rupee* of 16 *Annas* or 192 *Pice*	0	1	10½
" *Sicca Rupee*	0	2	0

The sum of 100,000 rupees is called a "lac," and of 10,000,000 a "crore," of rupees.

In 1835 the government remodelled the currency of India, establishing a more uniform system, in conformity with which accounts are mostly kept at present in rupees, reckoned of the value of 2 shillings. Silver is the only legal tender and standard of value.

Weights and Measures.

The *Maund* of Bengal, of 40 *seers*	=	2.054 lbs. avoir.
" " Bombay	=	28 lbs
" " Madras	=	25 lbs
" *Candy*, of 20 *maunds*	=	24.3 bushels.
" *Tola*	=	180 gr.
" *Guz* of Bengal	=	36 inches.

An Act "to provide for the ultimate adoption of an uniform system of weights and measures of capacity throughout British India," was passed by the governor-general of India in council in 1871. The Act orders: Art. 2 "The primary standard of weight shall be called a *seer*, and shall be a weight of metal in the possession of the government of India, equal, when weighed in a vacuum, to the weight known in France as the kilogramme." Art. 3. "The units of weight and measures of capacity shall be, for weights, the said *seer;* for measures of capacity, a measure containing one such *seer* of water at its maximum density, weighed in a vacuum." Unless it be otherwise ordered, the subdivisions of all such weights and measures of capacity shall be expressed in decimal parts "

Seaports. The only three ports of importance for American interests are Calcutta, Bombay, and Madras, here given in their alphabetical order: —

Bombay, a city, seaport, and capital of the presidency or province of the same name, is situated on a narrow neck of a small land at the S. E. extremity of the island of Bombay. The island consists of a plain about 11 m. long by 3 broad, flanked by two parallel lines of low hills. A neck of land stretching towards the S. W. forms the harbor on its E. side, sheltering it from the force of the open sea, and enclosing an expanse of water from 5 to 7 m. wide. At the S. W. of the island Back Bay, a shallow basin rather more than 2 m. in breadth runs inland for about 3 m. between the extreme points of the two ranges of hills. On a slightly raised strip of land between the head of Back Bay and the harbor is situated the fort, the nucleus of the city of Bombay. From this point the land slopes westward towards the central plain, a low-lying tract, which before the construction of the embankment known as the Hornby Velard used at high tide to be submerged by the sea. To the N. and E., although causeways and railway embankments have now shut out the sea, a large area of salt-marsh land still remains subject to inundation. The splendid harbor of Bombay and comparative nearness to the Suez Canal, with the system of railways which now connect Bombay with the other provinces, have marked out for it a career scarcely second, if at all second in commercial importance, to that of Calcutta itself The sudden demand for Indian cotton, which resulted from the American war, gave an unprecedented rapidity to its development. The cotton of Gujerat, Dharwar, and other parts of Bombay, is much superior to the Bengal fibre. Several years of brilliant prosperity culminated in 1866-7 in a financial crisis, that left the commerce of Bombay in a shattered state. Depending as it does chiefly on the one article of cotton, along with some export of grain and the government opium, the trade of Bombay rests on a narrower basis than that of Calcutta, which in years of misfortune has a large variety of staples to fall back upon, such as tea, indigo, jute, rice, hides, oil-seeds, etc. Moreover, Bombay has only the costly railway communication with the interior parts of India, while Calcutta commands the confluence of two of the greatest river systems in the world, the Brahmaputra and the Ganges. Nevertheless, Bombay is pressing close upon Calcutta as the commercial capital of India, its imports and exports being even greater. In 1878 its total foreign trade was $243,491,155, against a total of $230,035,640 in Calcutta. In natural scenery and in sanitary advantages of its position Bombay ranks first among the cities of India. The Bombay Island, or, as it ought to be more correctly called, the Bombay Peninsula, is now connected with the mainland by the railway causeways. It stands out from a coast ennobled by lofty mountains, and its harbor is studded by rocky islands and precipices, whose peaks rise to a great height. The approach from the sea discloses one of the finest panoramas in the world, — the only European analogy being the Bay of Naples. The town itself consists of well-built and unusually handsome native bazaars, and of spacious streets devoted to European commerce. In the native bazaar the houses rise three or four stories in height, with elaborately carved pillars and front work. Some of the European hotels and commercial buildings are on the American scale, and have no rival in any other city of India. The private houses of the European residents lie apart alike from the native and from the mercantile quarters of the town. As a rule, each is built in a large garden or *compound;* and although the style of architecture is less imposing than that of the stately residences in Calcutta, it is well suited to the climate, and has a beauty and comfort of its own. Though in general cooled by the sea-breeze, the temperature in Bombay is oppressively hot during May and October. A new future has lately been opened to manufacturing energy by the introduction of machinery from England. The ancient products of the presidency above named are chiefly household industries. But large steam-mills are now rapidly springing up in Bombay city, Broach, Surat, and other stations on the railway lines, especially in the cotton districts. Several of these employ over 1,500 hands, one is reported to have nearly double that number: and the low rates of wages, with the natural aptitude of the native for textile work, enables the Bombay mill-owners to compete with the Lancashire manufacturers, notwithstanding the heavy cost of importing machinery and of European supervision. Several of the mills have a capital of some hundreds of thousands sterling invested in them: and their superior reputation for turning out unglazed and genuine goods has almost driven the lower qualities of Manchester fabrics from the market. In 1873 fifteen mills were at work in the town and island of Bombay, and five in other parts of the presidency. Most of them have both spindles and looms, and their yarn and piece goods find a ready market. In Ahmedabad. Surat, Yeola, Nasik, and Bombay, considerable quantities of silk goods are made, the silk being imported from China either in the cocoon or in skeins. Gold and silver thread enter largely into the manufacture of silk and cotton fabrics. The *kinkhab* (kincob), the richest kind produced, is either gold thread and silk, or silver, gold, and silk. Embroidery in silk cloth and cotton, and in gold, silver, and silk thread, is carried on to some extent in Hyderabad, in Sinde, principally for European markets. Fibres are used for the manufacture of paper in Ahmedabad, Baroda, Surat, Nasik, Bombay, and Kolhapur. Mats, beds, etc., are manufactured from cocoa-nut fibre. Leather is worked into a variety of articles throughout the presidency. The manufactures of minor importance consist of pottery, brass and copper utensils, cutlery and agricultural implements, gold and silver ornaments, carved wood, ivory work, etc. In 1878, 5,611 ships, having a tonnage of 1,127,216 tons, cleared from Bombay harbor. Bombay is the only port of consequence in British India in which the rise and fall of the tide are so considerable as to admit of the formation of extensive wet docks. At ordinary spring-tides the rise is about 14 feet, but occasionally as high as 17. The capacious docks constructed by the East India Company are their property, and are for the most part under the direction of Parsees, who, excepting the Chinese, are the most industrious and intelligent people of the East. Merchant vessels of the largest class, or from 1,300 to 1,400 tons burden, for the cotton-trade to China, have been built in these docks. The timber having to be brought from a great distance, ships built at Bombay are very costly; but being, contrary to the practice in other parts of India, entirely constructed of teak, they are the most durable vessels in the world, requiring little repair, and often running 50 or 60 years. Being for the most part built by natives, without any very strict application of the rules of art, they are commonly, though not always, heavy sailers. — *Banks.* These consist of the Chartered Mercantile Bank of India, and the Chartered Bank of India, and branches of the Oriental Bank of London, the Agra Bank, etc. Including agencies of English houses, there are about 20 banks in all. Pop. 644,405.

Calcutta, the capital of Bengal, and seat of the supreme government in India, is situated in lat. 22° 34′ N. and lon. 88° 17′ E., on the east side of the Hoogley, one of the branches of the Ganges, about 100 miles from the sea. It extends nearly 4 miles along the river, with an average breadth of 1½ miles. The northern quarter, or the Black Town, inhabited by the native population, consists of narrow, dirty, unpaved streets, chiefly of mud hovels; the whole deep, black, and dingy, and offering a complete contrast to the front parts possessed by Europeans. These last generally present handsome detached brick houses, which, being stuccoed, have so elegant an appearance that Calcutta is sometimes called "the City of Palaces" and "the Indian Corinth." The stupendous fortification of Fort William is situated about one fourth of a mile below the town; and the intervening space, called the Esplanade, contains the magnificent residence of the governor-general. Adjoining the esplanade and the river-bank of the city is the "Strand," — a quay extending between 2 and 3 miles, and contiguous to which there is anchorage for ships of 600 tons; while Diamond Harbor, about 30 miles below, is sufficiently deep for the largest vessels. The access to the port is intricate, owing to shifting banks of sand and mud; but this disadvantage is outweighed by its ready intercourse, through the Ganges and its tributaries, with the richest and most populous regions of Hindostan, and which, joined to its being the place of chief resort of civil and military functionaries, has rendered Calcutta the principal commercial emporium of the East. Proposals have been made from time to time to remove the seat of the supreme government from Calcutta. Its unhealthiness, especially in the rainy season, its remoteness from the centre of Hindostan, and its distance from England, have each been animadverted upon. These disadvantages of Calcutta have now, however, been almost entirely removed, or their consequences have been mitigated by the conquests of science and modern engineering. The railway and the telegraph have brought the viceroy at Calcutta into close contact with every corner of India; while an ample water supply, improved drain-

age, and other sanitary reforms have rendered Calcutta the healthiest city in the East, — healthier, indeed, than some of the great European towns. English civilization has thus enabled Calcutta to remain the political capital of India. The same agency still secures the city in her monopoly of the sea-borne trade of Bengal. The river Hoogley, or Hugli, has long ceased to be the main channel of the Ganges; but Calcutta alone of all the successive river capitals of Bengal has overcome the difficulties incident to its position as a deltaic centre of commerce. Strenuous efforts of engineering are required to keep open the "Nadiyá Rivers," namely, the three offshoots of the Ganges which combine to form the Hoogley. Still greater watchfulness and more extensive operations are demanded by the Hoogley itself below Calcutta, to save it from the fate of other deltaic streams, and prevent it from gradually silting up. In 1853 the deterioration of the Hoogley channel led to a proposal to found an auxiliary port to Calcutta on the Matlah, another mouth of the Ganges. A committee, then appointed to inquire into the subject, reported that "the river Hoogley was deteriorating gradually and progressively." At that time "science had done nothing to aid in facilities for navigation," but since then everything has been done which the foresight of modern knowledge could suggest, or the power of modern capital could achieve. Observations on the condition of the river are taken almost hourly, gigantic steam-dredgers are continually at work, and the shifting of the shoals is carefully recorded. By these means the port of Calcutta has been kept open for ships of the largest tonnage, and now seems to have outlived the danger which threatened it. The small number of English resident in Calcutta (where, however, they are far more numerous than in any other part of India) may well excite surprise. It was supposed that the cessation of the Company's monopoly, and of the prohibition of European resort to India, would occasion an influx of British settlers and capital; but this anticipation has not been realized. Scarcely a single English agriculturist, with capital sufficient to cultivate 100 acres of land, has established himself in India, except for the cultivation of indigo and tea, and there has been no immigration of artisans. And this, after all, is only what might have been expected; the country being too fully occupied, the burden on the lands too heavy, and the wages of labor far too low, to admit of anything like an extensive European immigration. The Eurasians, the progeny of white fathers and native mothers, are mostly employed as clerks in the government offices and mercantile establishments, and are said to be an industrious and useful class. The principal merchants and traders consist of British and other Europeans, Portuguese born in India, Armenians, Jews, Persians from the coast of the Persian Gulf (commonly called Parsees), Moguls, Mohammedans of Hindostan, and Hindoos; the latter usually either of the Brahminical or mercantile castes, and natives of Bengal.

The principal foreign business is conducted by English merchants; but other parties also, either in partnership with the English or on their own account, speculate largely to Europe, America, and especially to China. The brokers known under the name of Sircars and Baboos are all Hindoos.

The port of Calcutta extends 10 m. along the Hoogley, with an average width of working channel of 250 yards, and with moorings for 169 vessels. The navigation of the river from the Sand Heads to Calcutta, a distance of about 130 m., is naturally dangerous and intricate; but rendered comparatively safe by a skilful and excellent, though costly, pilot establishment. In 1878, 2,231 vessels, with an aggregate tonnage of 2,672,618 tons, cleared the port of Calcutta. — *Banks*. The Bank of Bengal was established in 1809. Its authorized capital is 30,000,000 rupees, which, at 2s. the rupee, gives £3,000,000 or $15,000,000. The shares are selling at a high premium. The management is conducted by nine directors, — three appointed by government, and six elected by proprietors; time of service for the latter, three years. This bank possesses peculiar advantages, and consequently its circulation extends over a very large area, its notes being received at all public offices, in payment of revenue, by the collectors of the various districts. Besides this (exclusive of savings-banks) there are 26 other banks, or branches of banks, of which 17 are "limited." The nominal capital of these amounts in the aggregate is about £16,000,000, the paid up capital, however, falling much short of this amount. Pop. (including suburbs), 892,429.

Madras, the principal emporium of the coast of Coromandel, or western shore of the Bay of Bengal, lat. of lighthouse 13° 5′ 10″ N., lon. 80° 16′ 29″ E. It is the seat of the government of the second presidency of British India, having under it a territory, including the tributary states, of 257,042 square miles, with a population, according to the latest returns, of 36,060,551, paying in 1865 a gross annual revenue of about £7,000,000 sterling. The town had a population, in 1862, of 457,771, and is situated in the Carnatic province, a low, sandy, and rather sterile country. It is without port or harbor, lying close upon the margin of an open roadstead, the shores of which are constantly beaten by a heavy surf. Besides these disadvantages, a rapid current runs along the coast; and it is within the sphere of the hurricanes or typhoons, by which it is occasionally visited. In every respect, indeed, it is a very inconvenient place for trade, and its commerce is consequently greatly inferior to that of either Calcutta or Bombay; the value of imports for the year 1878 being only $19,497,165; and of exports, $35,039,370. — In Madras roads large ships moor in from 7 to 9 fathoms, with the flag-staff off the fort bearing W. N. W., 2 m. from shore. From October to January is generally considered the most unsafe season of the year, in consequence of the prevalence of storms and typhoons. On October 15 the flag-staff is struck, and not erected again until December 15, during which period a ship coming into the roads, or, indeed, anywhere within soundings on the coast of Coromandel (reckoned from Point Palmyras to Ceylon), vitiates her insurance, according to the conditions of the policies of all insurance offices in India. The cargo boats used for crossing the surf, called *Massula* boats, are large and light, made of very thin planks sewed together, with straw in the seams instead of calking. Pop. 397,552.

India-Cottons, a name applied, in upholstery trade, to a heavy kind of figured chintz.

India-Gum, an inferior kind of gum-arabic imported from Bombay and Calcutta.

India-Ink, or *China-Ink*. See INK.

India Matting, grass or reed mats, made in the East from *Papyrus corymbosus*, large quantities of which are exported.

Indiana, one of the States of the American Union, is bounded E. by the State of Ohio, S. by the river Ohio, which separates it from Kentucky, W. by Illinois, from which it is partly separated by the Wabash River, and N. by Michigan and Lake Michigan. It lies between lat. 37° 51′ and 40° 46′ N., and lon. 85° 49′ and 88° 2′ W. Extreme length from N. to S., 276 m.; greatest breadth, 175 m. Area, 33,809 sq. m. It is divided into 92 counties. *Indianapolis*, the capital and largest city of Indiana, is situated near the centre of the State, on the W. fork of White River, 100 m. N. W. of Cincinnati, in the middle of a fertile plain, and in the vicinity of an extensive coal-field. Its manufactures are varied and important, and its commerce very extensive. Ten lines of railroads centring there connect the city wiht all parts of the State and with the principal cities of the West. The population of Indianapolis, which was only 2,692 in 1840, numbers now about 80,000. The most important cities of Indiana, besides Indianapolis, are. Evansville, with a population of about 30,000; Fort Wayne, 25,000; Jeffersonville, 10,000; Lafayette, 16,000; La Porte, 8,000; Logansport, 11,000; Madison, 13,000; New Albany, 18,000; Richmond, 11,000; Bend, 9,000; Terre Haute, 20,000; Vincennes, 7,000. Total population of the State, about 2,000,000.

Indiana may be generally characterized as a great plain, inclining towards the S. W. A range of hills extends along the Ohio from the mouth of the Great Miami to Blue River, and the shore of Lake Michigan is lined by large sandy hills, which rise to a height of 200 feet. In some other parts are to be found "knobs," but these are seldom of great extent or elevation. The surface of the country naturally divides itself into several extensive river valleys. The valley of the Ohio, comprising an area of about 5,500 sq. m., is a limestone tract, and was originally covered with forests. About one third of it is rugged and broken, so as to be unfit for cultivation. The White River Valley, extending through the centre of the State, from the Wabash to the Ohio, contains about 9,000 sq. m. This district is almost uniformly level, and richly wooded, except in the W., where there are some ranges of low, rugged hills, and several patches of prairie ground. The soil is of the richest kind. The Wabash Valley is much larger than the others, and contains upwards of 12,000 sq. m. The eastern portion equals the White River Valley in fertility, but the other parts are not so productive. The N. part of the State, watered by the St. Joseph and the Kankakee Rivers, is somewhat more swampy than the Wabash Valley; and a large tract, comprising the sand-hills on Lake Michigan, is covered only with stunted pines and burr oaks. The State is well watered by numerous beautiful streams and rivers, but, with the exception of the Ohio and Wabash, few of them are navigable. The Wabash is the largest river that has its course mainly within the State, and, together with its branches, drains three fourths of the entire surface. It rises in the W. of Ohio, and flows first in a N. W. direction, and then S. W. till it meets the boundary of Illinois, which it follows southward for more than 100 m., till it falls into the Ohio, after a course of upwards of

500 m.: for 400 of which it is navigable for steamboats at high water. The Ohio forms the entire S. boundary of the State. The other principal rivers of Indiana are tributaries of the Wabash. The White River, the most important of these, is formed by the West and East Forks, — two rivers, respectively about 300 and 200 m. long, — which unite about 100 m. above its confluence with the Wabash. The Miami is formed by the St. Joseph and St. Mary in the N. E., and falls into the Ohio. The Upper St. Joseph, with its tributaries, passes through the northern counties, and falls into Lake Michigan. Indiana resembles the other Western States N. of the Ohio in climate. They are generally milder than those on the Atlantic coasts, but very subject to sudden changes. The winter is very severe in the N. parts, but more genial in the S. Except in the neighborhood of wet prairies and swamps, the climate is everywhere healthy. Indiana possesses all the elements of extraordinary fertility. The richest soil is that of the river bottoms, where it is very deep and exceedingly fertile. The most productive are those enclosed by the river hills, which run parallel to the Ohio and other rivers. The extensive valley of the Wabash is a tract of this description. Behind the river hills, a table-land spreads out, forming what may be called the interior of the country, and here, instead of the bottom-lands, or river valleys, there are vast prairies. The soil of these is not so luxuriant, but is such as amply to repay the expense of culture. Even the wet and marshy parts of the State admit of being brought under cultivation. Indiana produces large quantities of Indian corn, wheat, oats, and Irish potatoes, as well as a fair proportion of the other productions common to the Western States. The relative value of agricultural products for the year 1878 is given in this work under the names of each of the principal crops.

Fig. 285. — Seal of Indiana.

The number of farms in Indiana under cultivation, as reported by the last census, was 161,289, and the extent of improved land was 10,104,279 acres, 7,189,334 of woodland, and 826,035 of other unimproved land. The value of the farms returned was $634,804,189; of farming implements and machinery, $17,676,591. The orchard produce was estimated at $2,858,086, and market-garden products, $486,777; of forest products, $2,645,679. — The chief minerals of Indiana are coal, iron, lime, marble, freestone, and some copper. Of these the first is by far the most important. The coal-beds of Indiana, which form part of the great coal-field which extends through Illinois, Indiana, and Kentucky, cover an area of about 6,500 sq. m., in the S. W. part of the State, and extend from Warren Co. on the N. to the Ohio River on the S., a distance of about 150 m. They consist of three varieties of bituminous coal: caking coal, not-caking or block coal, and cannel coal. In 1879 there were about 60 mines in operation, whose daily production was about 600,000 tons. The quality of the coal, and its vicinity to available iron-ore beds, give to Indiana marked advantages for the manufacture of iron and steel. — Indiana has no direct foreign commerce, but it has a considerable transit trade, owing to its magnificent systems of canals and railroads. It exports large quantities of agricultural produce, agricultural implements, etc., and has a considerable trade in pork-packing; the hogs packed in this State, chiefly at Indianapolis, for the year 1878, numbering 496,025. — The principal canals are the Wabash and Erie Canal, between Evansville on the Ohio and Toledo on Lake Erie, 467 m., of which 379 m. are in Indiana; and the White Water Canal, 68 m. long, uniting Lawrenceburg on the Ohio with Hagerstown. In 1879 the State had 4,198 m. of railroad. The following table shows the names of the companies, the total length of roads, and the total length in Indiana: —

Companies.	Total length of line.	Total length of line in Indiana.
	miles.	miles.
Anderson, Lebanon, and St. Louis	19.39	19.39
Baltimore and Ohio and Chicago	262.60	146.35
Bedford, Springville, Owensburg, & Bloomfield	41.36	41.36
Cairo and Vincennes	157.00	6.92
Cambridge Extension	20.80	20.80
Carbon and Otter Creek Valley	1.60	1.60
Chicago, Cincinnati, and Louisville	71.47	71.47
Chicago and Eastern Illinois	152.26	19.79
Chicago and Illinois Southern	5.00	5.00
Chicago and Lake Huron	232.00	56.04
Cincinnati, Hamilton, and Indianapolis	98.20	78.60
Cincinnati, Lafayette, and Chicago	55.50	23.77
Cincinnati, Richmond, and Fort Wayne	90.90	90.90
Cincinnati, Rockport, and Southwestern	40.00	40.00
Cincinnati and Terre Haute	26.02	26.02
Cincinnati, Wabash, and Michigan	109.54	109.54
Cleveland, Columbus, Cin., and Indianapolis	391.20	84.60
Columbus, Chicago, and Indiana Central	580.50	416.70
Delphos, Bluffton, and Frankfort	15.00	15.00
Eel River	93.84	93.84
Evansville and Terre Haute	130.88	130.88
Evansville, Terre Haute, and Chicago	49.58	43.18
Fairland, Franklin, and Martinsville	38.03	38.03
Fort Wayne, Jackson, and Saginaw	100.00	52.58
Fort Wayne, Muncie, and Cincinnati	104.18	104.18
Frankfort and Kokomo	26.00	26.00
Grand Rapids and Indiana	332.10	52.27
Havanna, Rantoul, and Eastern	52.00	6.00
Indiana North and South	14.00	14.00
Indianapolis, Bloomington, and Western	333.90	78.51
Indianapolis, Cincinnati, and Lafayette	166.50	163.30
Indianapolis, Decatur, and Springfield	101.25	25.49
Indianapolis, Delphi, and Chicago	28.00	28.00
Indianapolis, Peru, and Chicago	72.87	72.87
Indianapolis and St. Louis	71.84	71.84
Indianapolis Union Railway	3.23	3.23
Indianapolis and Vincennes	116.63	116.63
Jeffersonville, Madison, and Indianapolis	224.85	224.85
Joliet and Northern Indiana	45.00	15.40
Kingan	0.42	0.42
Lafayette, Muncie, and Bloomington	118.20	118.20
Lake Erie, Evansville, and Southwestern	17.50	17.50
Lake Shore and Michigan Southern	864.60	167.70
Logansport, Crawfordsville, and Southwestern	93.00	93.00
Louisville, New Albany, and Chicago	288.26	288.26
Louisville, New Albany, and St. Louis	28.00	12.63
Michigan Central	270.00	42.53
Michigan Central Air-Line	114.72	5.62
Michigan City and Indianapolis	12.75	12.75
Mississippi and Atlantic	8.25	8.25
Ohio and Mississippi	393.00	226.47
Pittsburg, Fort Wayne, and Chicago	468.39	153.06
Richmond and Miami	10.17	10.17
St. Louis, Alton, and Terre Haute	207.00	6.00
St. Louis and Southeastern	208.20	28.41
Shelby and Rush	18.20	18.20
Terre Haute and Indianapolis	113.85	113.85
Union R.R. Transfer and Stock Yards	12.10	12.10
Wabash	600.20	166.00
White Water	62.05	62.05

In 1879 Indiana had 94 national banks in operation, whose paid-in capital was $15,026,530. There were, besides, 150 state banks, saving-banks, and private bankers, whose aggregate capital was $5,081,175. The State debt amounted to $4,998,178, of which $3,904,783 consisted of bonds held by the school fund. The total value of taxable property was $850,616,987.

Indianapolis. See Indiana.

Indianapolis, Bloomington, and Western R.R. runs from Indianapolis, Ind., to Pekin, Ill., 202.3 m., with extension from Champaign to Havanna, Ill., 100.7 m., and branch from White Heath to Decatur, Ill., 30.9 m.; total length, 333.9 m. This Co., whose offices are in Indianapolis, was formed in 1869 by the consolidation of the Indianapolis, Crawfordsville, and Danville, and the Danville, Urbana, Bloomington, and Pekin R.R. The main line was opened the same year. In 1874 the Co. defaulted on the interest on its bonds due in Oct. of that year, and the road was placed in the hands of a receiver, by whom it has since been operated. *Financial statement:* Cap. stock, $7,610,900; funded debt, $9,785,000, as follows: 1st mortgage Danville, Urbana, Bloomington, and Pekin R.R., issued 1869, $2,000,000, payable 1909, interest 7 % (April and Oct.); 1st mortgage Indianapolis, Bloomington, and Western R.R., issued 1869, $3,000,000, payable 1909, interest 7 % (April and Oct.); 2d mortgage (same lines), issued 1870, $1,500,000, payable 1890, interest 8 % (Jan. and July); 1st mort-

gage (same lines), extension, issued 1872, $3,285,000, payable 1912, interest 7 % (Jan. and July). The $2,000,000 1st mortgage bonds of the Danville, Urbana, Bloomington, and Pekin R. R., issued prior to consolidation, were intended to be exchanged for the 1st mortgage bonds of the consolidated roads, amounting to $5,000,000, of which but $3,000,000 have been issued, the remainder being held in trust for exchange. The sale of the extension road, which was effected in 1879, will modify the above statement.

Indianapolis, Cincinnati, and Lafayette R.R. runs from Lafayette, Ind., to Ohio State line, 158.5 m., with branch from Greensburg to Stone Quarries, 5.5 m., and the Hardentown Cut-off 2.5 m. In 1866 the Co. leased in perpetuity the Cincinnati and Indiana R.R., which runs from Cincinnati to the Indiana State line, 20.5 m., and in 1876 the Harrison branch from Valley Junction, O., to Harrison, O., 7.5 m., making a total of 194.5 m. operated. This Co., whose offices are in Cincinnati, O., was formed in 1866 by the consolidation of the Indianapolis and Cincinnati, and the Lafayette and Indianapolis R.R. Cos. The road has been in the hands of a receiver since 1876. *Financial statement:* Cap. stock, common, $5,587,150; preferred, $1,419,300; Cincinnati and Indiana R.R. stock, $18,000; funded debt, $8,593,300; unpaid coupons, $1,204,709.27. Funded debt in detail: 1st mortgage (Indianapolis and Cincinnati), issued 1858, $1,600,000, payable 1888, interest 7 % (April and Oct.); 1st mortgage (Cincinnati and Indiana), issued 1862, $499,000, payable 1892, interest 7 % (June and Dec.); 2d mortgage (Cincinnati and Indiana), issued 1867, $1,497,000, payable from 1877 to 1882, interest 7 % (Jan. and July); 2d mortgage (Indianapolis, Cincinnati, and Lafayette), issued 1867, $2,800,000), payable 1897, interest 7 % (Feb. and Aug.); equipment mortgage, issued 1873, $344,000, payable 1883, interest 10 % (March and Sept.); funded coupons (bonds of 1867), issued 1873, $125,550, payable 1878, interest 7 % (March and Sept.); 3d mortgage (joint bonds), issued 1869, payable 1899, interest 7 % (June and Dec.); funded coupons (bonds of 1869), issued 1873, $320,750, payable 1883, interest 7 % (March and Sept.); unpaid coupons on 3d mortgage and funded coupon bonds, $371,841. The Co. guarantee one half of $525,000 mortgage 6 % bonds of the Street Connection R.R. in Cincinnati, issued by the Cincinnati and Indiana and the Little Miami R. R. jointly. There are two issues of these bonds, one in 1864 for $250,000, and the other in 1868 for $275,000, both payable in 30 years from date.

Indianapolis, Decatur, and Springfield R.R. runs from Decatur, Ill., to Guion, Ind., 101.25 m., and is to be continued to Indianapolis. This Co., whose offices are in Tuscola, Ill., was formed in 1863 by the consolidation of two Cos., chartered in Indiana and Illinois under the name of the Indiana and Illinois Central R.R. Co., and which was sold under foreclosure in 1875. It is shortly to be continued to Indianapolis. *Financial statement*, 1878: Cap. stock, $500,000; funded debt, $2,943,000, as follows,—1st mortgage 30-year bonds, issued 1876, $274,000, interest 7 %; and 2d mortgage income 30-year bonds, issued 1876, $2,669,000, interest 7 %. The issue of 1st mortgage bonds is limited to $1,800,000. The 2d mortgage bonds represent the old 1st mortgage bonds.

Indianapolis, Peru, and Chicago R.R. runs from Indianapolis, Ind., to Peru, Ind., 72.87 m. This Co., whose offices are in Indianapolis, was first chartered in 1852 as the Peru and Indianapolis R.R. The road was opened in 1856, and the Co. reorganized under present title in 1876; it has issued no financial reports.

Indianapolis and St. Louis R.R. runs from Indianapolis, Ind., to Terre Haute, Ind., 71.84 m. This Co., whose offices are in Indianapolis, has leased the St. Louis, Alton, and Terre Haute R.R., 189 m., and its Alton Branch, 4.2 m., for a term of 90 years from 1867 at an annual rental of $450,000. It operates also the Carbon and Otter Creek Valley R.R., 1.6 m., specially used for carrying coal. *Financial statement:* Cap. stock, $600,000; funded debt, $3,500,000, as follows,—1st mortgage bonds, issued 1869, $2,000,000, payable 1919, interest 7 % (no fixed time); 2d mortgage bonds, issued 1870, $1,000,000, payable 1900, interest 7 % (April and Oct.); equipment bonds, issued 1871, $500,000, payable 1881, interest 8 % (Jan. and July).

Indianapolis and Vincennes R. R. runs from Indianapolis, Ind., to Vincennes, Ind., 116.63 m. This Co., whose offices are in Pittsburg, Pa., was organized in 1867, and the road opened in 1869. It is operated by the Pennsylvania Co., which possesses all its capital stock. *Financial statement:* Cap. stock, $1,402,000; funded debt, $3,150,000, as follows: 1st mortgage 7% bonds, $1,700,000, payable 1908, and 6 % bonds, $1,450,000, payable 1900.

Indian Hemp. See HEMP.

Indian Oak, a name sometimes applied to the teak-wood, *Tectona grandis.*

Indian Ocean, a vast oceanic basin, separated from the Pacific on the E. by the Eastern Archipelago and Australia, bounded on the S. by a line drawn from the Cape of Good Hope to Bass' Strait, divided from the Atlantic by Africa on the W., and enclosed by the countries of Asia on the N. It communicates with the Chinese Sea by the Strait of Malacca, Sunda Strait, and the Strait of Flores. Principal inlets, the Bay of Bengal, the Sea of Oman, the Persian Gulf, and the Red Sea. Chief straits, the Channel of Mozambique and Palk's Strait. The most important islands are Madagascar, Mauritius, Bourbon, the Comoro Islands, Seychelles, and Socotra, belonging to Africa; the Laccadives, Maldives, Ceylon, the Andaman and Nicobar Islands, to Asia. Its principal affluents are, in Asia, the Saluen, Irrawaddy, Brahmaputra, Ganges, Godavery, Kistna, Nerbuddah, Indus, and the Shat-el-Arab, formed by the junction of the Tigris and Euphrates; in Africa, the Zambeze. The chief seaports are, Calcutta and Bombay in India; Malacca, in the Eastern Archipelago; Aden, Mocha, and Muscat, in Arabia; Zanzibar, etc., in Africa. The monsoons, or periodical winds, prevail in the N. part of the ocean, blowing from the S. W. between April and October, and S. E. from October to April. Tempests are general at the periods of change, and between lat. 5° and 40° S. violent hurricanes frequently occur.

Indian-Red, a pigment obtained from a kind of red ochre, and producing purplish russet tints. It is brought from the East in the form of small lumps, and sometimes as a coarse, gritty powder. *Imp.* duty, 25 per cent.

Indian-Shot. See CANNA.

Indian-Yellow, a dye of questionable origin, said to be procured from the urine of the cow, after eating decayed and yellow mango-leaves; other authorities refer it to camels' dung. Analysis shows it to be composed chiefly of purreic acid, combined with magnesia. Its name, in some parts of the East, is Purree.

India-Rubber, Caoutchouc, Elastic Gum, the concrete juice of several tropical trees of both hemispheres, more particularly of *Siphonia elastica* (of South America), and *Ficus elastica* (of India). Immense quantities of *I.-R.* come from the Brazilian province of Pará, and from the U. States of Colombia. In order to obtain this substance, the natives of the valley of the Amazon make a longitudinal gash in the bark of the tree with a narrow hatchet; a thick, white, and oily liquid (a sort of vegetable milk) flows out, a wedge of wood is inserted to keep the gash open, and a small clay cup is stuck to the tree beneath the gash. In four or five hours the milk ceases to run, and each wound has yielded from three to five table-spoonfuls. The "seringero," or *I.-R.* gatherer, then empties the contents of the cups into an earthen vessel and commences the operation of forming it into shapes and smoking it. This must be done at once, as the milk soon coagulates. A fire is made on the ground, of nuts of the wassou-palm tree, over which is placed, inverted, an earthen pot with a hole in the bottom whence issues a jet of pungent smoke. Moulds are made either of clay or wood, which are dipped into the milk, and then passed slowly through the hot smoke. When the required thickness is obtained, the moulds are cut or washed out. Smoking changes the color of the rubber very little, but by exposure to the sun and atmosphere it becomes brown, and in time black. The superiority of the *I.-R.* imported from the valley of the Amazon is said to be owing to the peculiar properties of the smoke of this nut, no other smoke producing a similar effect upon the gum. A belt of forest trees extends 10 degrees each side of the equator which yield *I.-R.* of various kinds; so the supply is literally inexhaustible. The gum from India and the Pacific coast of South America is obtained by allowing the sap to flow down the side of the tree, and is then gathered with the loose bark and dirt into *ceroons* or bundles for shipment. — The general properties of *I.-R.*, as well as its numerous applications, are well known. The fresh juice has a cream-like appearance and consistence, is coagulated by heat, and is miscible with water, alcohol, and wood-naphtha; sp. gr. 1.012 to 1.041; it yields from 18% to 45% of solid *I.-R.*, either by heat or evaporation. By excluding it from the air it may be preserved unchanged for a considerable period. Solid *I.-R.* has a sp. gr. ranging between .919 and .941; it melts at 248° F. into a viscid mass, which does not again harden on cooling; it is unaltered by chlorine, hydrochloric acid, sulphurous acid, fluosilicic acid, ammonia, caustic alkaline lyes (even when boiling), and most similar substances; nitric acid and sulphuric acid act on it only by long contact when concentrated. Some specimens of *I.-R.* are harder than gutta-percha itself, and equally inelastic, whilst others never perfectly solidify, but remain in a condition resembling that of bird-lime or printer's varnish.

Up to 1820 *I.-R.* was used only for effacing pencil-marks, and about that time a piece half an inch square sold for 60 cents. But the extreme elasticity and extensibility of this singular substance was attracting the attention of practical men both in Europe and America. One of the earliest patents obtained for applications of caoutchouc was taken out in England by Mr. Thomas Hancock, of Newington, in 1820, for the use of *I.-R.* for the wrists of gloves, for braces, for garters, for boots and shoes instead of laces, and for other similar purposes. The rings for the wrists of gloves, etc. were simply cut from the bottle *I.-R.* by machinery the patentee himself contrived for that purpose. Mr. Hancock soon noticed and utilized the fact that two clean freshly cut surfaces of *I.-R.*, when pressed together, cohere and unite perfectly. This further led him to devising a machine by which all the waste cuttings and parings might be worked up. This machine consisted of a cylinder revolving within a cover, both being provided with steel teeth, by which the pieces of *I.-R.* placed between them were torn into shreds, and then kneaded into a solid coherent mass of homogeneous texture. The first machine of this kind would work up about 1 lb. of *I.-R.*, but now machines on the same principle are in use operating on more than 200 lbs. of material at once, and turning it out on a roll 6 ft. long and 10 in. or 12. in. in diameter. While Hancock was thus successful in mechanically working *I.-R.*, Macintosh, of Glasgow, found means of effecting its solution by coal-naphtha, and he obtained, in 1823, a patent for the application of his discovery to the fabrication of waterproof garments. Waterproof cloth is prepared by varnishing one side of a suitable fabric with a solution of *I.-R.*, or by covering one side of the cloth with a thin film, and then bringing it into contact with a second piece similarly prepared, the two *I.-R.* layers becoming incorporated when the double cloth is passed between rollers. Other solvents for *I.-R.* have been discovered in ether, chloroform, sulphide of carbon, and rectified turpentine. By treatment with these liquids it swells up, and eventually dissolves, producing a viscid, ropy mass, which, by evaporation of the solvent, leaves the *I.-R.* with all its original elasticity. By the use of these last-named solvents, the persistent and disagreeable odor occasioned by coal-oil is avoided. — It will now be observed that there are two distinct modes of working *I.-R.*: by dealing with the solid material, or with the solution. Thus, from a solid disk of *I.-R.* long ribbons of the material may be cut, and these ribbons, by being passed between a set of circular knives, may be divided into a number of square threads. These threads may then be drawn out to 6 or 10 times their length; and, if wound and maintained in this state of tension for 48 hours in a warm place, they will lose their condition of tension, and their elongated form will become their natural and unstrained one. In this manner are the *I.-R.* threads prepared, which, covered with silk or other material, form elastic fabrics, such as those used in the sides of boots. The circumstance of *I.-R.*, when heated for some hours at a temperature a little above the boiling-point of water, retaining whatever form it has during the heating, is the basis of obtaining thin sheets and other forms of the material. Tubes are made by forcing the heated *I.-R.* through an annular opening by application of great pressure; it sets in cooling, preserving a section corresponding with the orifice through which it issues. In another mode of forming tubes, a paste composed of *I.-R.*, oxide of zinc, and lime is formed into sheets, which are cut into strips. The strips are folded longitudinally, and the edges are cut together at an angle of 45° with the surface, so that the cut surfaces may meet each other when the strip is rolled on a mandril to give it a cylindrical form. A slight pressure suffices to solder together the cut surfaces, and the tube is then "vulcanized" by a process to be presently described. The dissolved *I.-R.* serves to prepare waterproof garments, round threads, sheets of *I.-R.*, etc. Fabrics are coated with the solution by pouring it on the material as it is passing horizontally from a roller. A straight-edge, under which the charged cloth passes, distributes the *I.-R.* in a uniform layer, the thickness of which is regulated by the space between the knife-edge and the fabric. When sulphide of carbon is the solvent used, its evaporation is complete in about 10 minutes, but with other solvents two or three hours are required. The *I.-R.* is usually mixed with lampblack before being spread on the cloth, and the article is finished by giving the *I.-R.* layer a coat of gum-lac varnish. Sheets of *I.-R.* are obtained by spreading 15 or 20 layers over a cloth, which is afterwards detached by wetting it with a solvent. — Threads of circular section are manufactured from a paste of *I.-R.* made by dissolving that substance in sulphide of carbon mixed with 8 per cent of alcohol. This paste is placed in a cylinder, out of which it is forced by a piston through a number of circular holes, whence it issues in the form of filaments. These are received upon a stretched cloth, which moves along, carrying the parallel threads, until the sulphide of carbon has evaporated. — A modification of *I.-R.*, possessing very valuable qualities for many purposes, was patented in 1839 by Charles Goodyear of New Haven, Conn., and largely applied by him to the fabrication of waterproof boots. In 1842 these boots were imported into Europe, and it was seen that this form of the material had the advantages of not sticking to other bodies at any ordinary temperatures, and of preserving its elasticy even in the coldest weather, whereas ordinary *I.-R.* becomes rigid by cold. The cut edges of this variety of *I.-R.* do not cohere by pressure. Mr. Goodyear attempted to keep his process a secret; but Mr. Hancock, having soon detected the presence of sulphur in the American preparations, set to work to discover how that substance was made to combine with the *I.-R.* He succeeded, and he obtained a patent for sulphurizing *I.-R.* before the original inventor had applied for one. Mr Hancock found that a sheet of *I.-R.* immersed in melted sulphur at 250° F. gradually absorbed from 12 to 15 per cent of its weight of sulphur; and, further, that this does not in any way alter its properties. When, however, the sulphurated substance was for a few minutes exposed to a temperature of 300°, it acquired new qualities, which were precisely those of the modification employed by Mr Goodyear for his impervious

boots. This transformation effected by sulphur Mr. Hancock called *vulcanization;* and *vulcanized I.-R.* is now employed in nearly all the innumerable applications of *I.-R.*, provided the presence of sulphur is not absolutely objectionable. Goodyear's process consists in mixing the sulphur with the *I.-R.*, the suitable proportion (7 to 10 per cent) having been determined beforehand, and the sulphur ground up with the *I.-R.* in the masticating machine, or disseminated through the viscid liquid if a solution is used, or dissolved in the solvent employed. This gives better results than Hancock's process, because the sulphurization is more uniform, and this method is, therefore, more largely employed. When the various articles have been fabricated in the ordinary manner from the mixture of *I.-R.* and sulphur, they are enclosed in vessels, where they are submitted for two or three hours to the action of steam under a pressure of nearly 4 atmospheres, so that the steam may have a temperature of about 280° F. A still easier method consists in steeping the articles (which in this case should be thin) in a solution of one part of chloride of sulphur in 60 of bisulphide of carbon. The object becomes vulcanized by simple exposure to the air, without the aid of heat. But this process is said to be liable to cause the article afterwards to become brittle. The addition of oxide of zinc, carbonate of lead, and other substances is found to yield a product better adapted for certain purposes than one in which only sulphur is used.

Among the many applications of vulcanized *I.-R.* those connected with its elasticity and its enormous contractile power when extended are particularly striking. Under Mr E. Smith's patent, torsion springs for roller blinds, door springs, clock springs, carriage springs, etc., are made of it. Mr. Hodges, in another patent, has availed himself of the same property as a new mechanical power. Short lengths of *I.-R.*, which he terms "vulcanized power purchases," are successively drawn down from or lifted to a fixed bearing, and attached to any weight which it is required to raise; when a sufficient number of these power purchases are fixed to the weight, their combined elastic force lifts it from the ground. Thus, 10 purchases of the elastic strength each of 50 lbs. raise 500 lbs. Each purchase is 6 inches long, and contains about 1¼ oz. of vulcanized caoutchouc. These 10 purchases, if stretched to the limit of their elasticity (not of their cohesive strength), will lift a weight exceeding 650 lbs. The same principle has been applied to relieve and equalize the strain on ships' cables, especially where several boats are towing one vessel; and as a projectile force. A number of power purchases, attached to the barrel of a gun constructed to project harpoons, will exert a power, if suddenly relieved, proportioned to their aggregate forces. By similar contrivances balls may be projected 200 yards or more, and a charge of No. 4 shot can be thrown 120 yards. A bow, in which the string alone is elastic (the reverse of the usual form), has been contrived which throws a 30-inch arrow 170 yards.

There are several patents for making artificial *I-R*, the best of which is a compound of chloride of sulphur, oil, and collodion In its plastic state it is easily moulded, and hard and durable when well set. It can be made of any color, and is susceptible of a high polish

The list of applications of vulcanized *I-R.* would be a very long one; but as a great number of these applications must be known to everybody, it will be unnecessary to specify them. Its employment in the construction of portable boats, pontoons, life-buoys, dresses for divers and for the preservation of life at sea, air-tight bags and cushions, air and water beds, cushions of billiard-tables, surgical implements, stereotype pages for printing, carriage springs, belts, hose, are a few of the thousand instances of its utility which might be quoted.

The last great improvement in the manufacture of *I.-R.* is the discovery that by continuing the process of vulcanization for a longer time at an increased heat and under pressure, a hard black substance is obtained, which can be turned in a lathe like ebony. This substance is now applied to an extraordinary number of uses. See VULCANITE.

The first company organized in the U. States to manufacture *I.-R.* into waterproof clothing was the Roxbury India-Rubber Company, established at Roxbury, Mass., by Mr. Edwin M. Chaffee, and chartered in 1833. This important industry has since been largely developed in this country, where *I.-R.* is manufactured in a great variety of articles and on a large scale, principally in New York and in the New England States. For the year 1878 our imports of *I.-R.* and gutta-percha amounted to 12,512,203 lbs., valued at $4,711,102; which came chiefly from Brazil ($2,457,398), the U. States of Colombia ($1,006,521), and India, mostly through England ($884,711). Manufactured goods to the value of $242,564 were also imported, mostly from England For the same year the exports of boots and shoes and other *I.-R.* manufactures amounted to $305,767.

Imp. duty: crude *I.-R.* or milk of *I-R*, free; raw, or unmanufactured (bottles, slabs, and sheets), free. — Manufactures of *I.-R.*, mixed with silk or other material, 45 per cent. — Boots and shoes, 30 per cent. — Braces, suspenders, webbing, or other fabrics, wholly or part of *I.-R.*, n. o. p. f., 35 per cent. — Articles wholly of *I.-R.*, n. o. p. f., 25 per cent.

Indicator, an index machine for various purposes; a water-gauge in a steam-engine; the dial and mechanism of a dial telegraph, etc.

Indigo, a blue dyestuff extracted from several leguminous plants indigenous to the tropical regions of Asia, Africa, and America, especially from *Indigofera tinctoria* and *I. anil*, which are naturalized in the Southern States, and were formerly cultivated in S. Carolina and Florida. It exists in the plant as a colorless juice. The method of manufacture consists in steeping the plant in water until fermentation sets in; the coloring matter dissolves in the water, forming a yellow solution, which is drawn off from the rest of the vegetable matter, and agitated and beaten to bring it freely into contact with the air for about 2 hours; this treatment causes the *I.* to form and settle down as a blue precipitate; this is cut, while soft, into cubical cakes, and dried by artificial heat. To hasten the formation of the *I.*, a little lime-water is sometimes added to the yellow solution. The *I.* of commerce contains *Indigo-blue* or *Indigotine*, its most important constituent, *Indigo-red*, and many other substances, some of which must be regarded as accidental impurities or adulterations. *I.* is tasteless; scentless; of an intense blue color, passing into purple; when rubbed with a smooth hard body, it assumes a coppery hue. It is insoluble in water, cold alcohol, ether, alkalies, hydrochloric acid, dilute sulphuric acid, and the cold fixed and volatile oils; slightly soluble in boiling alcohol and oils; freely soluble in concentrated sulphuric acid, and, when decolored or reduced by contact with deoxidizing substances, in alkaline lyes. Its color is destroyed by chromic acid, nitric acid, and chlorine; when suddenly heated, it gives off rich purple fumes, which condense into brilliant copper-colored needles. The best *I.* is that which has the deepest purple color, that assumes the brightest coppery hue when rubbed with the nail; its fracture is homogeneous, compact, fine-grained, and coppery; its powder is of an intensely deep blue tint, and light enough to swim on water; and it leaves only a fine streak when rubbed upon a piece of white paper. In general, when *I.* is in hard, dry lumps of a dark color it is considered of bad or inferior quality. *I.*, when in hard or brittle lumps, or in dust or small bits, is often adulterated with sand, pulverized slate, and other earthy substances. For its properties and use in dyeing, see DYEING (BLUE COLORS).

I., imported from the several parts of British India, Java, and Manilla, differs much in quality and in shades of color. The best Bengal *I.* is shipped from Calcutta in cubical cakes of a light blue color, and possesses all the qualities above enumerated. Other qualities are of shades of violet, red, and copper-color. The African *I.*, from Egypt and Senegal, are of finer blue shades, but generally contaminated with earthy matters. The best American qualities, as some of those from the U. States of Colombia, are equal to the best Bengal. The consumption of late years has not increased in a ratio corresponding to the increase of population and the expansion of manufactures, — a circumstance which seems attributable to the decreasing use of blue cloth, in the dyeing of which it is principally used, and perhaps also to the introduction of substitutes suggested by the advanced state of chemical knowledge. The American *I.* is generally enclosed in sacks of coarse linen sewed into an ox-hide, a kind of package which is called a *seron*, and contains usually about 250 lbs. The East Indian is in chests of about 3½ factory maunds, or 260 lbs. The imports into the U. States for the year 1878 amounted to 1,831,494 lbs., valued at $1,537,680, which came mostly from the East Indies (1,343,343 lbs., valued at $1,164,599), and from the U. States of Colombia (341,327 lbs., valued at $303,868).

Imp. duty: Indigo, free; carmined, 20 per cent; paste, 10 per cent; extracts, 10 per cent.

Indigo-Blue, the pure blue principle of indigo, also called *indigotine*. — The tint or color produced by the indigo dye. — A preparation of indigo,

usually in small lumps, for the use of the laundry.

Indigo-Purple, a coloring matter consisting of interlaced silky crystals having a coppery lustre, obtained by filtration from a solution of indigo in forming sulphuric acid, when largely diluted with water.

Indigo-White, a grayish-white mass of minute crystals, generally light blue on the surface, and rapidly turning blue on exposure to the air; soluble in alkalies, alcohol, and ether, to which it imparts a yellow color. These solutions deposit indigo-blue on exposure to the air. A solution of this substance constitutes the indigo vat of the dyer.

Indisine. See ANILINE (VIOLET).

Indisputable, undeniable, not open to cavil; policies of insurance which are not to be questioned when once granted are termed indisputable.

Indite, to commit words to writing; to direct or dictate to another.

Indorsement is the assigning of a negotiable document, such as a bill of exchange or promissory note, by a writing on the back. The person who assigns is called the *indorser*, the person in whose favor the assignation is made, the *indorsee*. *I.*, in its full and common acceptation, conveys to the indorsee all the rights previously existing in the indorser, with the addition of a claim against the indorser himself. To enable this to be accomplished, however, there must be words intimating an intention on the part of the acceptor to pay to any bearer, or to any person holding right through the original payee, such as, "or order," "or bearer," otherwise the bill is a mere chose in action, and the *I.* does not convey a right against the maker, but merely a claim on the indorser. It is held, however, that negotiable words omitted by mistake may be supplied. In Scotland, every bill or note is negotiable, unless it bear a special restriction. A bill payable simply "to bearer" is transferable without *I.*; but the person who delivers it does not by such act become a party. There is no form of words necessary for an *I.*,— the mere signature of the payee, called a blank *I.*, is a sufficient transference to the bearer. An *I.* with the name of the indorsee, and instructions to pay to him, is an *I.* in full. If a bill is once indorsed blank, it is assignable by delivery, notwithstanding posterior *I.* in full, unless they be restrictive. A restrictive *I.* may restrain the negotiability of a bill. "Pay to A B only," or "Pay to A B for my use," are forms of restrictive *I.* An *I.* is not restrictive from having a consideration on the face of it. An *I.* may be qualified so as to bar the responsibility of the indorser, and merely transfer to the indorsee the claim against the previous parties. The usual form of accomplishing this is by appending to the signature the words *sans recours*. A bill cannot be indorsed for part of its contents after acceptance; but if partly paid, it may be indorsed as to the residue. A person who has delivered a bill without *I.*, when it was the understanding of parties that it should be indorsed, may be compelled in equity to do so; and if he die in the mean time, his executor or administrator may indorse. An indorsee of a bill, who has given value for it, is not liable to objections which may be pleaded against a previous holder, unless aware of them when he took the bill. A bill paid by the party originally liable ceases to be negotiable; but not so a bill paid by an indorser. Where the illegality of the original transaction makes a bill or note void, an indorsee, however onerous, cannot recover from the original drawee, but the indorser is liable to him, both on the bill and for the original debt. An indorser on whom recourse is intended to be had must receive notice of non-acceptance or non-payment; and though, as between the drawer and drawee, notice may be rendered unnecessary from want of value, this will not affect the indorser's right to notice.

Indulgence, a favor granted; an extension of time of payment granted to a debtor; forbearance to press for payment.

Industrial, relating to industry: those identified with the manufacturing pursuits, or producing arts, are said to be industrially occupied.

Industrial Exhibition, INDUSTRIAL SHOW, a public display of objects of industry, utility, and skill.

Industrial School, a trade school; one where some of the mechanical arts or useful occupations are taught.

Inelegant, plain; wanting polish or beauty; not handsome.

Infancy, strictly, childhood; but, in law, a person under the age of 21, who is not considered answerable for debts incurred.

Inferior, of second-rate quality; not the best of anything.

Inflammable, easily set on fire.

Informal, not regular, or customary; contrary to instructions.

Information, intelligence given. — A judicial inquiry and process.

Informer, one who lays an information charging a party with some breach of the customs or excise laws; and who receives a moiety of the penalty recovered.

Infraction, a breach or violation of a rule, law, or ordinance.

Infringement, a violation of an agreement, or right; an infraction of copyright, or of the patent rights of another.

Patent Law of the U. States — Revised Statutes, Sec. 4919 "Damages for the *I.* of any patent may be recovered by action on the case, in the name of the party interested, either as patentee, assignee, or grantee. And whenever in any such action a verdict is rendered for the plaintiff, the court may enter judgment thereon for any sum above the amount found by the verdict as the actual damages sustained, according to the circumstances of the case, not exceeding three times the amount of such verdict, together with the costs — *Sec* 4920. In any action for *I* the defendant may plead the general issue, and having given notice in writing to the plaintiff or his attorney, 30 days before, may prove, on trial, any one or more of the following special matters: 1. That for the purpose of deceiving the public the description and specification filed by the patentee in the Patent Office was made to contain less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect: or, — 2. That he had surreptitiously or unjustly obtained the patent for that which was in fact invented by another, who was using reasonable diligence in adapting and perfecting the same; or, — 3. That it had been patented or described in some printed publication prior to his supposed invention or discovery thereof; or, — 4. That he was not the original and first inventor or discoverer of any material and substantial part of the thing patented; or, — 5. That it had been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public. — And in notices as to proof of previous invention, knowledge, or use of the thing patented, the defendant shall state the names of patentees and the dates of their patents, and when granted, and the names and residences of the persons alleged to have invented, or to have had the prior knowledge of the thing patented, and where and by whom it had been used; and if any one or more of the special matters alleged shall be found for the defendant, judgment shall be rendered for him with costs. And the like defences may be pleaded in any suit in equity for relief against an alleged *I.*: and proofs of the same may be given upon like notice in the answer of the defendant, and with the like effect. — *Sec.* 4922. Whenever, through inadvertence, accident, or mistake, and without any wilful default or intent to defraud or mislead the public, a patentee has, in his specifi-

cation, claimed to be the original and first inventor or discoverer of any material or substantial part of the thing patented, of which he was not the original and first inventor or discoverer, every such patentee, his executors, administrators, and assigns, whether of the whole or any sectional interest in the patent, may maintain a suit at law or in equity, for the *I.* of any part thereof, which was *bona fide* his own, if it is a material and substantial part of the thing patented, and definitely distinguishable from the parts claimed without right, notwithstanding the specifications may embrace more than that of which the patentee was the first inventor or discoverer. But in every such case in which a judgment or decree shall be rendered for the plaintiff no costs shall be recovered, unless the proper disclaimer has been entered at the Patent Office before the commencement of the suit. But no patentee shall be entitled to the benefits of this section if he has unreasonably neglected or delayed to enter a disclaimer."

Infusible, incapable of fusion, or of being melted.

Infusion, a preparation obtained by pouring boiling water on a substance, as on tea in tea-making.

Inga Beans, a Brazilian name for the pods of the horse cassia, or bastard cassia.

Ingate, GATE, GEAT, GIT, TEDGE, an aperture in a mould for pouring in metal.

Ingenio [Sp.], a steam-engine; a sugar-boiling house.

Ingenuity, ready invention; dexterity, skill in any operation.

Ingot, a small wedge-shaped mass of metal, as of copper, tin, gold, or silver, etc., of an indefinite size or weight. In some countries ingots of the precious metals pass current, as silver in China.

Ingredient, a component part of a compound body; one of many substances.

Ingrain, a name given to yarns, wools, etc., dyed with fast colors before manufacturing. *Ingrain carpet*, see CARPET.

Ingrossing, purchasing large quantities of corn or other merchandise on speculation, with an expectation of increasing their value.

Inhaler, an apparatus used for inhalation of any vapor or volatile matter for medicinal requirements. — A respirator for protecting the lungs from the inhalation of damp or mephitic air.

Many instruments have been devised for inhalation of chloroform, ether, and other anæsthetic agents. One of the best is perhaps the following: A metal box adapted to the shape of the face is made to cover the mouth and nostrils. This piece has two valves, one of which admits the air and vapor from an elastic tube connected with the apparatus containing the substance, and prevents its return; the other valve is a flap opening outwards, which allows the expired air to escape. There is also an adjustment for admitting directly into the mouthpiece more or less atmospheric air. The best plan, however, for administering anæsthetic vapors, is the oldest and simplest, which consists in folding a coarse towel into the form of a small cone, and placing in the bottom a small sponge containing the liquid. At the commencement the sponge should be held at a small distance from the mouth, and the patient be directed to inhale by deep and long-continued inspirations, notwithstanding the cough. As he gets more and more under the influence, it should be approached to the face, but it is imperatively necessary that there should be a free admission of atmospheric air.

Initials, the first or capital letters of a name.

Initiate, to instruct in the rudiments of an art; to acquaint with.

Injection, a medicated liquor thrown into a cavity by a syringe.

Injection-Pipe, a pipe for injecting cold water into the condenser of an engine. The entrance of water from the sea, river, or tank, into the pipe, is governed by the injection-valve.

Injector, a contrivance for injecting a supply of feed-water into the body of a steam-boiler. Giffard's injector (described under FEED-PUMP), and Sellers's improved injector on the Giffard principle, are the most extensively used injectors.

Injunction, a legal prohibition or restraint, as upon the infringement of a patent right.

Injury, damage done to goods, fixtures, or rights, etc.

Ink [Fr. *encre;* Ger. *Dinte;* It. *inchiostro;* Sp. *tinta*], a pigment or fluid for writing or printing with, of which there are several kinds.

Black Writing-Ink. Gall-nuts, sulphate of iron, and gum are the only substances truly useful in the preparation of ordinary ink; the other things often added merely modify the shade, and considerably diminish the cost to the manufacturer upon the great scale. Many of these inks contain little gallic acid, or tannin, and are therefore of inferior quality. The following receipt gives an excellent ink, black, fluent, and permanent. Digest three quarters of a pound of bruised nut-galls in a gallon of cold water, then add six ounces of sulphate of iron, and an equal weight of gum-arabic, and four or five drops of creosote as an antiseptic. Let the mixture digest for three or four weeks, shaking it up now and then, after which decant the clear fluid. The only improvement of importance which has been made in the manufacture of writing ink from the common materials, during the last few years, is the practice of first roasting the gall-nuts, which is now adopted by a few of the houses most celebrated for their *copying ink.* In this way a portion of pyrogallic acid is formed, which is very soluble in water, and strikes an intense bluish-black color with the protosulphate or green sulphate of iron. From galls so treated an ink may be made to write black at once. Care must, however, be taken to avoid any loss of materials by volatilization. To prevent any tendency to mouldiness in ink, a few bruised cloves, or a little oil of cloves, or, still better, a few drops of carbolic acid, may be added. The last two should be previously dissolved in a small quantity of strong vinegar or rectified spirit. With the same intention some of the large makers allow the ink to become covered with a skin of "mould" in the cask, to render it less liable to undergo the same change when subsequently bottled. — Ink long exposed to moisture and to the atmosphere turns brown, through becoming converted into peroxide of iron. The writing of documents which has become yellow and pale from age may be restored by passing over it, with a fine brush, a solution of gall-nuts, which, uniting with the iron, re-forms a black gallotannate. Ink-stains submitted to the action of an alkaline carbonate during washing become converted into spots of yellow peroxide, or iron-moulds. These may be removed by dissolving the iron oxide with an acid that will not attack the fibre of the cloth, such as oxalic acid, a weak solution of hydrochloric acid, and several others.

Blue Ink. The blue ink first introduced by H. Stephens, of London, is remarkable for a blue color, which soon after drying changes to deep black, for perfect fluidity, and tenacious adherence to the paper. It is a tanno-gallate of iron dissolved in sulphate of indigo, the coloring matter thus not being suspended as in the ordinary inks, but in complete solution. Hornung's receipt is to mix 4 parts of solution of perchloride of iron with 750 parts of water, and precipitate with 4 parts of cyanide of potassium in solution; the precipitate collected is washed with several additions of water, and allowed to drain until it weighs about 200 parts; it is then dissolved in one part of oxalic acid.

Copying Ink. This is usually prepared by adding a little sugar or other saccharine matter to ordinary black ink, which for this purpose should be very rich in color, and preferably made with galls prepared by heat, as noticed above. Writing executed with this ink may be copied within the space of 5 or 6 hours, by passing it through a press in contact with thin unsized paper, slightly damped, enclosed between two sheets of thick oiled or waxed paper, when a reversed transcript will be obtained, which will read in proper order when the back of the copy is turned upwards.

Indelible Ink. Many formulæ have been given for indelible inks, but they are all inferior in simplicity and usefulness to the one now prescribed. Solution of nitrate of silver thickened with gum, and written with upon linen or cotton cloth, previously imbued with a solution of soda, and dried, is the ordinary permanent ink of the shops. Before the cloths are washed, the writing should be exposed to the sunbeams, or to bright daylight, which blackens and fixes the oxide of silver. It is easily discharged by chlorine and ammonia. A good permanent ink may be made by mixing a strong solution of chloride of platinum with a little potash sugar, and gum to thicken. The writing made therewith should be passed over with a hot smoothing-iron to fix it.

Indian and Chinese Ink consists of cakes made of lamp-black and size, or animal glue. The Chinese, however, in manufacturing this ink, do not use animal glue, but vegetable juices, which render it more brilliant and lasting. When Indian ink is prepared with the best lamp-black, levigated with the finest gelatine, or solution of glue, it forms an ink of good color, but wants the shining fracture and permanency of Chinese ink. Indian ink is used in Europe for designs in black and white, in which it possesses the advantage of being able to afford gradations of tone according to the degree of its dilution with water.

Printing Ink consists essentially of a mixture of lamp-black,

finely divided carbon, and oil. The qualifications of a good printing ink are: 1. That it should distribute freely and easily, and work sharp and clean; 2. that it should not have too much tenacity for the type, but should have a much greater affinity for the paper, and so come off freely upon it; 3. it ought to dry almost immediately on the paper, but not dry at all upon the type or rollers; this is particularly necessary in newspaper printing: 4. it should be able to withstand all the effects of time and chemical reagents, and should never change color. The quality of the linseed-oil employed, and even the character of the seed from which the oil is obtained, requires great attention. In making printing-ink, the linseed oil is first clarified from all fatty matters, and the pure oil is boiled at a carefully regulated temperature. During the boiling the best pale yellow soap is added, and the required driers are then mixed with it. The best lamp-black is obtained from the smoke of naphtha, the combustion of which has been regulated with care. This black is ground up intimately with the drying oil, which has assumed almost the character of a varnish, and the ink is complete. Excellent receipts for this ink will be found in *Ure's Dictionary of Manufactures*

Red Ink may be made by infusing, for three or four days in weak vinegar, Brazil wood chipped into small pieces; the infusion may be then boiled upon the wood for an hour, strained, and thickened slightly with gum-arabic and sugar. A little alum improves the color. A decoction of cochineal with a little water of ammonia forms a more beautiful red ink, but it is fugitive. An extemporaneous red ink of the same kind may be made by dissolving carmine in weak water of ammonia, and adding a little mucilage.

Sympathetic Inks are such as are invisible until heat or some other power is employed to develop them. A dilute solution of chloride of copper, used for writing, is invisible until the paper is heated, when the letters are seen of a beautiful yellow, disappearing with the heat that developed them. The addition of a salt of nickel renders them green.

Yellow Ink is made by dissolving 3 parts of alum in 100 of water, adding 25 parts of Persian or Avignon berries bruised, boiling the mixture for an hour, straining the liquor, and dissolving it in 4 parts of gum-arabic. A solution of gamboge in water forms a convenient yellow ink. By examining the different dyestuffs and considering the processes used in dyeing with them, a variety of colored inks may be made.

Ink-Block, in printing, a block on which the ink is spread, to be taken up by the balls or rollers.

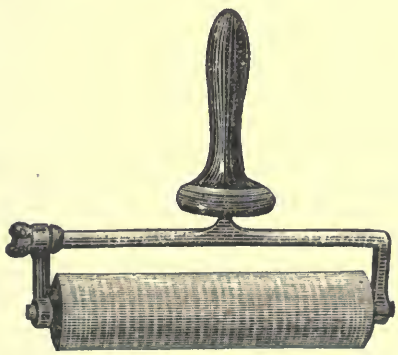

Fig. 286.—Hand Inking-Roller.

Inking-Roller, a roller with handles (Fig. 286), used by printers for spreading ink over type, wood-cut blocks, or engraved plates.

Inking-Table, a table of peculiar construction, used by letter-press printers to supply the roller with the requisite quantity of ink during the process of printing.

Inkle, a species of broad linen tape. Unwrought inkle, or short spinel, is bleached yarn.

Inkstand, a tray or stand for holding an ink-bottle, pens, etc.

Inlaid Work. See Buhl, Marquetry, Mosaic, Parquetry, Pietra Dura, etc.

Inland Bills, drafts and bills of exchange, drawn and payable in the same State.

Inland Trade, interior or domestic trade; the home transport and supply of goods over the country, and which does not pass the sea.

Inlayer, a mosaic-worker; a cabinet-maker who ornaments work with veneers or devices in various-colored woods; a manufacturer of papier-mâché who inserts nacreous shell into a prepared ground.

Inlet, an entrance.—A creek or bay.—Inserted materials.

Inmate, a lodger; an occupier; the member of a household; one who lives with a family.

Inn, an English tavern or hotel; a place of lodging and entertainment; differing from a public or ale-house, which does not usually provide beds or food for travellers.

Innovation, a novelty or change; a departure from old practices, laws, or customs.

Input [Scotch], the share in a contribution; the balance in change of money.

Inquest, a judicial inquiry or examination.

Inquiry, a scrutiny or investigation; a close examination.

Inscribe, to write or engrave on anything; to mark with characters; to address or dedicate.

Inscription, a writing or title on a tomb, or on an address; a piece of plate presented, etc.

Insect Powder, Persian Powder, the powdered flowers of *Pyrethrum carneum*, a Caucasian plant, used for the destruction of vermin.

Insertions, narrow strips of lace, embroidered muslin, or cambric, sold for inlets in handkerchiefs, dresses, etc.; work in general added, or joined, to enlarge or ornament ladies' fancy-work.

Inset, Offcut, in book-binding, one leaf or more of printed paper, set in the middle of a folded sheet, and bound with it.

Insides, passengers in the interior of a vehicle.—Perfect paper, from which the outsides or faulty sheets have been removed.

Insignia, badges of office; decorations.

Insoles, a thickness of cork, felt, paper, etc., placed inside a shoe to protect the sole of the foot, or to improve the fit of the shoe.

Insolvency, Bankruptcy. An insolvent, or bankrupt, is, in a general sense, a person who is unable to pay his collective debts. A creditor is a person who trusts another with his property, and who thereupon puts himself in a position which is, as contrasted with the debtor, naturally and comparatively defenceless. To sustain and protect him, the law, in all civilized communities, lends its power to constrain the debtor into the fulfilment of his contract. In the French law of bankruptcy, which in its excellent characteristic particulars has been admitted into many European countries, and is still making progress, insolvency is distinguished from bankruptcy, and bankruptcy itself is divided into simple and fraudulent. In England, as in the U. States, the term *bankrupt* is now equivalent to insolvent, and both are indifferently applied to designate any individual unable to pay his debts. All classes of individuals, even those who have least to do with industrious undertakings, are exposed to vicissitudes and misfortunes, the occurrence of which may render them incapable of making good the engagements into which they have entered, and render them bankrupt or insolvent. But though bankruptcy be most frequently, perhaps, produced by uncontrollable causes, it is frequently also produced by persons living beyond their means, and by their repugnance to make those retrenchments which the state of their affairs imperatively demands; and sometimes, and, we regret to have to add, not infrequently, bankruptcy originates in fraud or bad faith. But, however it may be occasioned, whether by the misfortunes, the folly, or the fraud of the individual, it ought, *prima facie*, to be viewed as a very grave

moral offence. No man is justified in entering into engagements, or making promises, which he has not a reasonable prospect of being able to fulfil; nor is he justified in applying the money or loans that may have been made to him, or the property that may have come into his hands in the course of his business, to maintain an expenditure that decidedly exceeds his ordinary income or profits. Those who persevere in a system of this sort cannot, if they think at all, expect to arrive at any goal other than bankruptcy. They must know that they are carrying on a system of deception; that they are contracting debts which they can never pay; and that, in truth, they are as really swindlers as if they had offered fictitious bills or dock-warrants in payment of their bonds. And hence the difficulty of dealing with this subject. Misfortunes, when they really occur, or the failure of reasonable speculations, are easily dealt with; but all bankruptcies not at once accounted for in that way involve serious grounds of suspicion, and should be thoroughly sifted. Inasmuch, however, as the circumstances which end in bankruptcy are often of a very complicated character, and difficult to disentangle, it is not easy to lay down any general rules for dealing with them. And hence it is that the laws with respect to bankruptcy have differed very widely in different countries and periods of society, and that it is not, perhaps, possible to suggest any system against which pretty plausible objections may not be made. The U. States bankrupt law of March 2, 1867, though defective in several of its dispositions, was a great improvement on the past, by securing uniform commercial legislation through a country whose commercial interests are so intimately connected. Every business man can study and master the law of his own State; but few are those who have time and facilities to get acquainted with the almost inextricable complications of thirty-seven laws, frequently differing the one from the other on the most essential points. The uncertainty resulting from separate State legislation on commercial matters is certainly the greatest check to confidence, and therefore the repeal of the national law of 1867 (see BANKRUPTCY) is much to be regretted. Since the repeal of that law, the laws of the different States respecting insolvency, assignments for the benefit of creditors, exemptions of property from liability for debts, and attachments of property upon mesne process, have become again of general interest. The following are some of the general rules governing these matters, after which is given a short epitome of the insolvent laws for each State: —

General Rules. A discharge in insolvency does not affect the rights of a creditor, who is not within the jurisdiction of the State when the discharge is granted, and does not submit himself to that jurisdiction by proving his claim against the estate of the debtor. In the absence of statutes, assignments of property for the benefit of creditors are valid, even though they provide for preferences, and for a release of the debtor by creditors taking the benefit of them. An involuntary assignment will not prevail against attaching creditors in the second State. A voluntary assignment will not prevail against a prior attachment, nor against a subsequent attachment, unless the assignment is valid under, and executed with, the formalities required by the laws of the State where the property is attached.

Alabama. No insolvent law. Original attachments, foreign and domestic, are issued by judges of the circuit or county courts, or justices of the peace. An attachment may issue, although the debt or demand of the plaintiff be not due; and shall be a lien on the property attached, until the debt or demand becomes due, when judgment shall be rendered and execution issued. A non-resident plaintiff may have an attachment against the property of a non-resident defendant; provided he gives good and sufficient resident security in the required bond; making oath that the defendant has not sufficient property within the State of defendant's residence to satisfy the debt or demand. Exemptions: homestead, $2,000; selected personal property, $1,000

Arizona. No insolvent or assignment law. Attachments issue in action upon contract for direct payment of money when plaintiff has no security, or when defendant is not resident, etc. The plaintiff must give bond. Exemptions: homestead, $5,000; certain personal property, $1,200; domestic animals, etc.

Arkansas. No insolvent law. An attachment may be issued against the property of a non-resident; and also against a resident of the State when the latter is about to remove out of the State; or is about to remove his goods or effects; or about to secrete himself so that the ordinary process of law cannot be served on him. Exemptions: homestead, $2,500; personal property of head of family, $500.

California. An insolvent law, by which a debtor surrendering his property may receive a discharge from his debts. No preferences permitted. No discharge in case of fraud, nor from debts due as a depositary of funds received as banker, broker, or commission merchant. Creditors may proceed by attachment: 1. When the defendant has absconded, or is about to abscond from the State, or is concealed therein to the injury of his creditors; 2. when the defendant has removed, or is about to remove, any of his property out of the State, with intent to defraud his creditors; 3. when the defendant fraudulently contracted the debt, or incurred the obligation, respecting which the suit is brought; 4. when the defendant is a non-resident; 5. when he has fraudulently conveyed, disposed of, or concealed his property, or a part of it, or intends to convey the same to defraud his creditors. In California the real estate shall be bound, and the attachment shall be a lien thereon, although the debt or demand due the plaintiff be not due, — in case the defendant is about to remove himself or his property from the State. The law of attachment applies in California, *when the contract has been made in that State, or when made payable in that State.* Exemptions: homestead, $5,000, or, if party is unmarried, $1,000; household articles, $200; library, etc.

Colorado. No insolvent or assignment law. Attachments (plaintiff giving bond) when defendant is non-resident, or conceals himself, or stands in defiance of officer, or in the case of fraud, etc. Exemptions: to head of family, homestead, $2,000; tools and stock, $200; wearing-apparel, household goods, and furniture, $100; library of professional men, $300; animals, farming tools, etc.

Connecticut. Insolvent law, with compulsory proceedings, which may be taken by creditor to amount of $100. Property put into hands of trustee. Discharge from debts proved, upon payment of seventy per cent. Debtors' property exempt for two years from legal process upon debts which might have been proved. Attachment may be granted against the goods and chattels and land of the defendant; and likewise against his person when not exempted from imprisonment on the execution in the suit. The plaintiff to give bonds to prosecute his claim to effect. Exemptions: necessary wearing-apparel and furniture.

Dakota. No insolvent law. Assignments without preferences allowed, but are void against any creditor not assenting thereto, if they tend to coerce the creditor to release his claim, or provide for payment of fraudulent claim, or reserve any benefit to assignor, or confer any power upon assignee, which may delay the conversion of the assigned property, or exempt the assignee from liability from neglect of duty, etc. Attachments (plaintiff giving bond) when defendant is non-resident, absconds, conceals, or conveys property in fraud of creditors, etc. Exemptions: one acre in town, or 160 acres in country, with buildings; selected personal property, $1,500, besides absolute exemption.

Delaware. No insolvent law. Assignments governed by the common law, except that a special partnership may not give preferences. A writ of domestic attachment issues against an inhabitant of Delaware when the defendant cannot be found; or has absconded with intent to defraud his creditors; and a writ of foreign attachment when the defendant is not an inhabitant of this State. This attachment is dissolved by the defendant's appearing and putting in special bail at any time before judgment. Exemptions: personal property, $275.

District of Columbia. No insolvent or assignment laws, except that assignments of the property of a special partnership, with preferences, are void. Attachment (plaintiff giving bond) when the defendant is non-resident, or removes or is about to remove his property, etc. Exemptions: clothing, furniture, $300; tools, $200; library, $400; provisions, etc.

Florida. No insolvent or assignment law. Attachments (the plaintiff giving bond) when defendant is non-resident, or about to part with his property fraudulently, or remove from the State, or fraudulently secretes property, etc. Exemptions: homestead, 160 acres in country, half-acre in city, with buildings; personal property, $1,000.

Georgia. No insolvent law. Assignments regulated by a statute, which forbids preferences, or making a release of the debtor a condition precedent to receipt of dividends. A judge of the superior court, or a justice of the inferior court, or a justice of the peace, may grant an attachment against a debtor whether the debt be matured or not, when the latter is remov-

ing without the limits of the State, *or any county*, or conceals himself. The remedy by attachment may be resorted to by non-resident as well as by resident creditors. The necessary affidavit may be made before any commissioner appointed by the State to take affidavits. Indorsers of notes, obligations, and all other instruments in writing, are entitled to the same remedy as provided for securities. In all cases the attachment first served shall be first satisfied. No lien shall be created by the levying of an attachment, to the exclusion of any judgment obtained by any creditor, before judgment is obtained by the attaching creditor. Exemptions: homestead to head of family, $1,600; personal property, $1,000.

Idaho. Insolvent law, under which the debtor is discharged upon making an assignment, as therein provided, except in cases of fraud. Attachments (plaintiff giving bond) in actions upon contract for the direct payment of money, when the plaintiff has no lien or security, or when the defendant is a non-resident, etc. Exemptions: homestead, $5,000; certain enumerated personal property.

Illinois. No insolvent law. Assignments, without preference, allowed and regulated by statute. Attachments (plaintiff giving bond) when defendant is non-resident, absconds, conceals himself or his property, is guilty of fraud, etc. Exemptions: homestead, $1,000; furniture, $100; selected property, $100; certain farm stock.

Indiana. No insolvent law. Assignments, without preferences or provision for release of debtor, allowed and regulated by statute. Attachments substantially same as Illinois. Exemptions: real or personal, at option of debtor, $300.

Iowa. No insolvent law. Assignments, without preferences, allowed and regulated by statute. The plaintiff may cause any property of the defendant, which is not subject to execution, to be attached at the commencement, or during the progress, of the proceedings, whether the claim be matured or not; provided an affidavit is filed to the effect that the defendant is a foreign corporation, or acting as such, or that he is a non-resident of the State, or (if a resident) that he is in some manner about to dispose of or remove his property out of the State. Exemptions: homestead, half-acre in town, forty acres in country, with buildings thereon; enumerated personal property, $1,200.

Kansas. No insolvent law. Assignments, without preference, allowed and regulated by statute. Attachment substantially as in Illinois. Exemptions: homestead, one acre in town, 160 acres in country, with improvements; furniture, $300; and other enumerated articles of personal property.

Kentucky. No insolvent law. Assignments regulated by statute. Any preference may be set aside in six months. The plaintiff may have an attachment against the property of the defendant: 1, when the latter is a foreign corporation, or a non-resident of this State; or, 2, who has been absent therefrom four months; or, 3, has departed from the State with intent to defraud his creditors; or, 4, has left the county of his residence to avoid the service of a summons, or conceals himself that a summons cannot reach him; or, 5, is about to remove his property, or a material part thereof, out of the State; or, 6, has sold or conveyed his property with the intent to defraud his creditors, or is about so to sell or convey. Such attachment is binding upon the defendant's property in the county from the time of the delivery of the order to the sheriff. Exemptions: homestead, $1,000; furniture, $100; some farming stock, etc.

Louisiana. Insolvent law, with compulsory proceedings by a judgment creditor, upon return of the execution "no property found." The debtor makes a surrender to the creditors, and may be discharged by consent of a majority of creditors in number and amount, except in case fraud or preference is proved. Assignments without preference may be made without regard to the insolvent law. A creditor may obtain an attachment against the property of his debtor upon affidavit: 1, when the latter is about leaving permanently the State before obtaining or executing judgment against him; 2, when the debtor resides out of the State; 3, when he conceals himself to avoid being cited to answer to a suit, and provided the term of payment have arrived. In the absence of the creditor, the oath may be made by his agent or attorney, to the best of his knowledge and belief. Exemptions: homestead and stock, $2,000; furniture, etc., $600.

Maine. Insolvent law, passed in 1878, modelled on the U. States bankrupt law of 1867. Voluntary petition may be filed by debtor owing $300. Involuntary proceedings by at least two creditors, having one fourth in amount of the provable debts. Debtors owing less than $300 may make an assignment in a summary manner. No percentage is required to be paid to entitle a debtor, for the first time insolvent, to discharge. Attachments within four months from date of filing petition dissolved. Preferences given within two months void, and may be recovered by assignee. Assignments are probably acts of insolvency, and may be set aside by the assignee in insolvency, if made within four months of the filing of the petition. Otherwise, probably good, if without preferences. Attachments on mesne process in all cases. Exemptions: homestead, $500 (if recorded in proper office); furniture, $50, and certain specified articles.

Maryland. Insolvent law, under which the debtor is discharged upon surrender of his property, except where fraud or preference is proved. Assignments subject to rules of common law. A creditor may obtain an attachment, whether he be a citizen of Maryland or not, against his debtor, who is not a citizen of this State, and not residing therein. If any citizen of the State, being indebted to another citizen thereof, shall actually run away or abscond, or secretly remove himself from his place of abode, with intent to evade the payment of his just debts, an attachment may be obtained against him. An attachment may be laid upon debts due the defendant upon judgments or decrees rendered or passed by any court of this State, and judgment of condemnation thereof may be had, as upon other debts due the defendant. Exemptions: $100 selected property; books, tools.

Massachusetts. Insolvent law, similar to the U. States Bankrupt law of 1867. Proceedings generally the same, except that involuntary petition may be filed by one creditor, and the acts of insolvency are not so numerous. Discharge upon payment of fifty per cent, or by consent of majority of number and value of creditors. None in case of fraud or preference. Original writs may be framed, either to attach the goods or estate of the defendant, or, for want thereof, to take his body; or, there may be an original summons, either with or without an order to attach the goods or estate. All real estate, or goods and chattels that are liable to be taken in execution, may be attached upon the original writ, in any action in which any debt or damages are recoverable, and may be held as security to satisfy such judgment as the plaintiff may recover. Exemptions: homestead $800, upon recording claim in proper office; furniture, $300; stock and tools, $100; and certain other articles of personal property.

Michigan. Insolvent law, by which a debtor, with the consent of two thirds of his creditors, and upon surrendering his property, may be discharged Assignments allowed. The grounds of attachment are: 1. that the defendant has absconded, or is about to abscond, or has concealed himself; 2. that he has assigned, or concealed, or is about to remove, his property, with a view to defraud; 3. that he fraudulently contracted the debt, or incurred the obligation, about which the suit is brought; 4. that be is not a resident of the State, or has not resided there three months immediately preceding the suit; 5. that the defendant is a foreign corporation. Exemptions: homestead, 40 acres in country, with house thereon; or, lot and house in town worth $1,500; household goods, $250; clothing and library, $150; tools and implements, $250.

Minnesota. No insolvent law. Assignments without preference, allowed and regulated by statute. Attachment (plaintiff giving bond) when defendant is non-resident, conceals his property, is guilty of fraud, etc. Exemptions: homestead, 80 acres and buildings in country, lot and house in town; furniture, $500; animals, with food, and farming utensils, $300; provisions, tools, etc., $400.

Mississippi. No insolvent law. Assignments not requiring a release of the debtor allowed. An attachment against the estate, including real estate, slaves, goods, chattels, etc., of a debtor, when it is shown that he has removed, or is about removing or absconding from the State, or privately conceals himself. Attachment, also, lies against the property of non-resident decedents. It may be obtained before the debt is due for which it issues, when the creditor has ground to believe that the debtor will remove with his effects out of the State, or has removed. Exemptions: homestead, 80 acres, $2,000; furniture, $100; professional libraries, $250; animals, provisions, etc., $100.

Missouri. No insolvent law. Assignments, without preference, allowed and regulated by statute. An attachment may be issued here when the debtor is not a resident of the State; or, if a resident, when he absconds, absents, or conceals himself; or is about to remove his property, or fraudulently convey it, with a view to hinder or delay his creditors; or where the debt was contracted out of the State, and the debtor has secretly removed his effects into this State with intent to defraud. Exemptions: homestead (against all debts subsequent to title), in places of 40,000 inhabitants, $3,000; in places of less than 40,000 inhabitants, $1,500; clothing, tools, etc., $150; furniture, $100; provisions, $100.

Montana. No insolvent or assignment law. Attachments in action upon contracts to pay money, the plaintiff giving bond in double the value of property attached; also before debt due, if debtor fraudulently disposes of his property to defraud his creditors. Exemptions: homestead, $2,500; necessary furniture, tools, etc.; books, $100

Nebraska. No insolvent law. Assignments, without preference, allowed and regulated by statute of 1877. Attachments (the plaintiff giving bond) when defendant is not resident, or conceals property, or is guilty of fraud, etc Exemptions: homestead in country, 160 acres, with buildings; in town, 20 acres and house, not to exceed $2,000; if no homestead, $500 personal property.

Nevada. Insolvent law. No percentage or consent required for discharge, which is only from debts mentioned in the schedules. None, if fraud or preference, etc. Assignments forbidden. Attachment (the plaintiff giving bond) in actions upon contract for direct payment of money when plaintiff has no security. Exemptions: homestead, $5,000, furniture, $100; domestic animals, tools, etc.

New Hampshire. No insolvent law. Assignments, without preference or provision for release of the debtor, allowed and regulated by statute. A writ of attachment may be issued upon the institution of any personal action; and will hold real and personal property, shares of stock in corporations, pews in churches, and the franchise of any corporation authorized to receive tolls, until the period of thirty days from the time of rendering the judgment. Exemptions: homestead, $500; furniture, $100; tools, $100.

New Jersey. No proper insolvent law. Assignment law by which the debtor is discharged from the debt proved under assignment, except when the debtor is guilty of fraud or concealment, etc. Attachment when defendant is non-resident, or absconds from his creditors. Exemptions: homestead, $1,000; personal property, $200; and all wearing-apparel.

New Mexico. No insolvent or assignment law. Attachments substantially as in Illinois. Exemptions: homestead, $1,000; clothing, tools, books, furniture, etc.

New York. Insolvent law, under which the debtor surrendering his property is discharged by consent of the persons representing two thirds of the debts. No discharge if fraud or preference is proved. No involuntary proceedings unless the debtor is imprisoned. Assignments and the duties of assignees have been regulated by acts of 1877 and 1878. The attachment-law is a legal mode by which a title to property may be acquired by operation of law. When the debtor, who is an inhabitant of New York, absconds, or is concealed, a creditor to whom he owes $100, or any two to whom he owes $150, or any three to whom he owes $300, may, on application to a judge or commissioner, and on due proof of the debt, and of the departure or concealment, procure his real and personal estate to be attached; and on due public notice of the proceeding, if the debtor does not within three months return and satisfy the creditor, or appear and offer to contest the fact of having absconded, or offer to appear and contest the validity of the demand and give the requisite security, then trustees are to be appointed, who become vested with the debtor's estate; and they are to collect and sell it, and settle controversies, and make dividends among all his creditors, in the mode prescribed. From the time of the notice, all sales and assignments by the debtor are declared to be void. If the debtor resides out of the State, and is indebted on a contract made within the State, or to a creditor residing within the State, although upon a contract made elsewhere, his property is liable to be attached and sold in like manner; but the trustees are not to be appointed until nine months after public notice of the proceedings. Perishable goods, other than vessels, when attached under the Absconding Debtor Act, may be immediately sold and converted into money; and if the sheriff, under the attachment, seizes property claimed by third persons, he is to summon a jury and to take their inquisition as to the title to the property claimed. If any American vessel belonging to the debtor be attached under these proceedings, it may be released on the claimant of the vessel giving security to pay the amount of the valuation of the vessel to the trustees, or to the debtor, as the case may be; and if it be a foreign vessel claimed by a third person, the attaching creditor must give security to prosecute the attachment, and to pay the damages if it should appear that the vessel belonged to the claimant. A creditor, having an unliquidated demand resting on contract, is a creditor within the Absconding Debtor Act, and competent to apply for the attachment. Any creditor may proceed against an absconding or concealed debtor, being an inhabitant of the State, or against any non-resident debtor, if the contract was made in New York; but if the contract was made elsewhere, then the creditor must be a resident of the State. Exemptions: homestead, $1,000, must be recorded in the county where situate; clothing, furniture, and supplies; tools, $25; library, $50; certain domestic animals, etc.

North Carolina. A law by which, upon surrendering his property, the person of the debtor is free from liability to arrest or imprisonment, except when fraud is proved, but the debt is not discharged. Assignments allowed. Attachments substantially as in Illinois. Exemptions: homestead, $1,000; selected personal property, $500.

Ohio. A law similar to that of North Carolina. Assignments, without preference, allowed and regulated by statute. A creditor may procure, before or after the maturity of the claim, an attachment against the property of a debtor, where the latter is a foreign corporation or a non-resident; or, if a resident, when he has absconded, or left the county of his residence, or conceals himself; or is about to remove or convert his property, with a view to defraud his creditors. When the debtor fraudulently contracted the debt, or incurred the obligation. Exemptions: homestead, $1,000; or, if no homestead, selected personal property, $500; clothing, furniture, certain domestic animals, tools, etc.

Oregon. Attachments (the plaintiff giving bond) upon all contracts, payment of which is unsecured. Voluntary assignment law dissolves attachments, if made at any time before judgment distributes assets *pro rata* among all creditors presenting claims within three months. Exemptions: books and pictures, $75; clothing, $100, and $50 additional for each member of family if a householder; tools, etc., $400. Special exemption to householders of 10 sheep, 2 cows, 5 swine, etc. Household goods, furniture, etc., to value of $300 besides.

Pennsylvania. Law similar to that of North Carolina. Assignments without preference allowed and regulated by statute. Attachments substantially as in Illinois. Exemptions: real or personal property, $300; clothing, books, etc.

Rhode Island. No insolvent law. Assignments allowed and regulated by a recent statute which took effect September, 1878. Attachments, or levies, within sixty days after the same are made or commenced, may be dissolved by an assignment without preferences under the act. Upon the giving of a preference by the debtor, any three creditors holding not less than one third of the debts may petition the supreme court in equity for the appointment of a receiver of his estate, who is to take possession like an assignee in bankruptcy. Preferences given by the debtor within sixty days of the commencement of proceedings are void as under U. States bankrupt law of 1867. There is no provision for the discharge of the debtor Attachments, when defendant is non-resident, or fraudulently contracted the debt, or conceals or disposes of his property, or has refused to apply his property to the payment thereof. Exemptions: furniture, etc., $300; tools, etc., $200.

South Carolina. No insolvent law. Assignments according to common law. Attachments substantially as in Illinois. Exemptions: homestead, $1,000; furniture, tools, etc.. $500.

Tennessee. Law as to insolvency and assignments same as in South Carolina. Attachments substantially as in Illinois. Exemptions: homestead, $1,000; household goods and stock.

Texas. Law as to insolvency and assignments same as in South Carolina. Attachments substantially as in Illinois. Exemptions: homestead, $5,000; furniture, tools, and certain animals.

Utah. Law as to insolvency and assignments same as in South Carolina. Attachments (when plaintiff has no security) substantially as in Illinois. Exemptions homestead, $1,000; and $250 for each member of the family; furniture, tools, provisions, etc.

Vermont. Insolvent law of 1876, modelled on the U. States bankrupt law of 1867, with involuntary proceedings by one creditor to amount of $250. No discharge, unless assets equal thirty per cent debts, or by consent of majority in number and amount of debts proved. No discharge also in substantially same cases as in bankrupt law. Assignments appear to be acts of insolvency, which may be set aside by an assignee in insolvency if made within four months of filing his petition. Attachments on mesne process in all cases. Exemptions: homestead, $500; specified articles of furniture, tools, etc.

Virginia. No insolvent or assignment laws. Attachments substantially as in Illinois. Exemptions: to a householder, head of a family, real or personal property, $2,000; library, $100; wearing-apparel, furniture, etc.

Washington Territory. Law as to insolvency and assignments same as Virginia. Attachments substantially as in Illinois. Exemptions: homestead, $1,000; clothing, libraries, furniture, animals, tools, etc., $200.

West Virginia. No insolvent law. Assignments regulated by statute, preferences being allowed. Attachments same as in Virginia. Exemptions: homestead, $1,000; personal property, $200.

Wisconsin. Insolvent law, by which debtor is discharged upon surrendering property and complying with law. Assignments, with preferences, unless by limited partnerships, allowed and regulated by statute. Attachments substantially as in Illinois. Exemptions: homestead, forty acres in country, one-fourth acre in town; clothing, furniture, $200; farming tools, $50; tools or stock in trade, $200; printing material or presses, $1,500; etc.

Wyoming. No assignment or insolvent laws. Attachments substantially as in Illinois. Exemptions: homestead, $1,500; selected personal property, $500. Exemptions apply to residents of the territory only.

Arrest for debt, when nothing unfair or improper is involved in its contraction, still remains in some of the U. States. The policy of such arrest is not a little questionable. and notwithstanding the deference due to the authorities who have vindicated this practice, we confess we are unable to discover anything very cogent in the reasonings advanced in its favor. Provided a person in insolvent circumstances intimate his situation to his creditors, and offer to make a voluntary surrender of his property to them, he has, supposing he has acted honestly, done all that should be required of him, and ought not to undergo any imprisonment. If, indeed, he have deceived his creditors by false representations, or have grossly misconducted himself, or have endeavored to convey away any part of his property, then, undoubtedly, he should be subjected to the pains and penalties attached to swindling; but when such practices are not alleged, or cannot be proved, sound policy, we apprehend, would dictate that creditors should have no power over the persons of their debtors, and that they should be entitled only to their effects. If a tradesman trust an individual with a loan of money or goods which he is unable to pay, he has made a bad speculation. But why should he, because he has done so, be allowed to arrest the debtor's person? If he wished to have perfect security, he either should not have dealt with him at all, or dealt with him only for ready money. Such transactions are, on the part of tradesmen, perfectly voluntary; and if they place undue confidence in a debtor who has not misled them by erroneous representations of his affairs, they have themselves only to blame.

The following table shows the number of failures that occurred throughout the U. States and the Dominion of Canada, with liabilities, for the years 1876, 1877, 1878, and 1879: —

STATES AND TERRITORIES.	Number in Business.	1879. Failures.	1879. Liabilities	1878. Failures.	1878. Liabilities.	1877. Failures.	1877. Liabilities.	1876. Failures.	1876. Liabilities.
Eastern States.			$		$		$		$
Maine	11,245	87	796,600	170	1,406,200	149	2,037,400	138	1,916,450
New Hampshire	7,295	62	417,748	111	854,739	70	762,728	48	559,255
Vermont	6,649	63	359,736	113	1,843,350	96	738,269	73	1,410,930
Massachusetts	38,877	335	4,820,592	604	12,707,645	480	6,659,054	462	12,994,829
Boston City		170	3,613,200	325	11,279,523	130	6,469,300	258	10,510,000
Rhode Island	5,083	95	3,094,562	130	2,521,981	114	3,599,607	138	6,079,056
Connecticut	13,188	158	2,474,844	281	4,680,588	314	5,821,649	197	4,186,548
Total Eastern States	82,337	970	15,577,282	1,734	35,294,026	1,353	26,088,007	1,314	37,657,068
Middle States.									
New York	75,212	785	8,389,378	969	15,791,084	1,012	15,994,846	908	19,311,933
New York City	34,247	519	13,303,969	863	42,501,731	865	32,490,974	887	33,244,018
New Jersey	20,104	143	1,201,086	168	4,741,993	177	3,313,958	159	2,273,141
Pennsylvania	62,475	522	8,242,649	770	18,714,270	632	15,540,795	545	10,731,880
Philadelphia City	19,158	189	3,086,116	257	10,373,700	175	4,946,443	138	4,281,495
Delaware	3,628	14	186,137	23	281,500	15	193,000	19	209,600
Maryland	12,949	85	916,874	119	2,568,986	129	3,603,634	145	2,104,637
District of Columbia	2,764	33	207,982	30	320,202	44	1,090,100	18	87,977
Total Middle States	230,537	2,290	35,534,191	3,199	95,293,466	3,049	77,173,750	2,909	72,244,681
Southern States.									
Virginia	10,540	84	848,666	126	1,195,615	159	1,312,705	172	3,351,289
West Virginia	5,743	27	124,000	40	369,011				
North Carolina	7,013	100	1,000,290	89	1,067,200	70	439,569	126	994,918
South Carolina	4,662	73	2,497,740	59	1,788,522	66	1,168,501	89	1,500,114
Georgia	8,599	86	574,323	119	3,738,134	103	1,181,631	147	3,110,145
Florida	1,918	19	120,077	22	133,288	11	149,000	14	121,000
Alabama	5,483	24	202,109	51	874,062	43	690,000	51	771,821
Mississippi	5,686	76	991,374	99	1,073,660	86	1,079,986	81	738,258
Louisiana	7,907	90	4,752,557	127	4,830,462	61	893,519	80	1,438,143
Texas	12,394	159	1,223,892	228	2,733,725	138	1,890,696	167	1,900,515
Arkansas	4,349	48	425,427	41	407,653	23	270,775	35	268,257
Kentucky	17,542	138	1,546,577	220	5,905,756	227	6,994,428	241	6,659,247
Tennessee	8,738	152	1,569,671	194	2,205,873	91	1,201,110	158	2,229,553
Total Southern States	100,574	1,076	15,876,703	1,415	26,322,961	1,078	17,271,920	1,361	23,063,260
Western States.									
Ohio	51,298	260	3,230,176	515	10,799,300	373	5,866,818	371	5,414,893
Cincinnati City		74	1,177,699	216	7,570,311	126	3,710,584	96	3,191,349
Indiana	27,285	122	1,509,791	374	5,233,549	352	5,718,700	362	4,787,401
Illinois	51,250	194	3,396,480	470	7,672,931	454	8,117,091	434	6,079,710
Chicago City		83	2,237,300	362	12,926,800	206	10,065,300	199	9,164,200
Michigan	25,701	179	2,063,894	339	6,627,709	310	8,032,902	576	9,736,852
Wisconsin	19,590	145	1,886,345	163	2,317,382	154	2,128,710	209	4,307,314
Iowa	23,463	152	1,121,900	400	3,428,100	350	2,604,100	491	3,909,080
Minnesota	10,073	128	1,241,697	149	1,052,403	114	1,291,852	132	1,565,684
Missouri	31,208	83	284,394	101	1,036,416	81	717,232	84	1,272,737
St. Louis City		56	2,444,000	167	4,171,200	141	7,239,850	83	2,618,557
Kansas	11,449	66	392,043	44	647,902	50	355,635	48	435,900
Nebraska	5,266	66	221,800	106	825,400	45	838,300	37	93,600
Total Western States	256,583	1,608	21,207,519	3,436	64,309,503	2,756	56,187,074	3,122	52,577,277
Pacific States and Territories.									
Oregon	3,060	55	438,045	13	173,500	29	266,170	34	422,416
California	17,343	251	2,650,736	310	6,899,539	288	3,252,852	169	1,670,973
San Francisco City		221	5,317,118	222	4,700,591	163	8,483,424	79	2,202,698
Colorado	3,572	47	335,661	58	541,542	58	880,103	45	505,582
Nevada	1,661	34	425,100	87	419,797	56	659,736	25	206,167
Utah	1,485	10	383,854	17	121,050	11	44,300	1	6,000
New Mexico	498	8	26,639	10	63,900	4	16,300	...	......
Wyoming	393	12	25,400	11	62,050	4	7,200	10	140,900
Idaho	425	...	......	...	......	4	46,000	3	30,500
Dakota	1,600	11	68,000	7	83,000	8	31,300	10	83,400
Montana	513	3	90,000	...	......	...	......	3	75,000
Washington	1,050	58	171,305	3	16,900	7	207,800	6	203,864
Arizona	526	4	21,500	6	81,307	4	54,000	1	8,000
Total Pacific States and Territories.	32,126	714	9,953,358	694	13,163,176	636	13,949,185	386	5,555,500
Grand Totals	702,157	6,658	98,149,053	10,478	234,383,132	8,872	190,669,936	9,092	191,117,786
Dominion of Canada	55,964	1,902	29,347,937	1,697	23,908,677	1,892	25,523,903	1,728	25,517,991

From the foregoing figures it appears that the mercantile failures in the U. States during the year 1879 were in number 6,658, with liabilities aggregating slightly over 98 millions of dollars. The failures of 1878 were in number 10,478, with liabilities of 234 millions. The decrease for the year 1879 is therefore most marked, there having been 3,820 less failures than in the previous year; while the liabilities decreased by 136 millions of dollars.

Inspection, a surveillance; an examination.

Inspector, a superintendent or overseer.

Instalments, a debt divided into several parts, and paid at different times.

Instant, the present or current month, abbreviated *inst.*

Institution, an organized society for promoting any object, public or social. Thus, a college is termed a *collegiate institution;* an academy of belles-lettres, a *literary institution;* an almsgiving society, a *benevolent* or *charitable institution;* while a banking company or insurance office is a *commercial institution.*

Instructor, a teacher; one who imparts knowledge or skill of any kind.

Instrument, a law term for a written document or deed. — A tool used for any purpose; an artificial machine, as mathematical, nautical, philosophical, and electro-magnetic instruments.

Instrumental, pertaining to musical instruments.

Insulate, to isolate or detach; to separate or cut off, as in electricity.

Insulator, a bad conductor of electricity, so called from being used as support for bodies in which electricity is to be retained. When a wire or other conductor is surrounded on all sides by glass, porcelain, or other non-conducting substance, it is said to be *insulated.*

Insurance, in its legal definition, is a contract of indemnity, one party engaging to make good to another the pecuniary loss that may be, or may be presumed to be, occasioned by any future or contingent event, in consideration of a sum certain received or promised. The most obvious subjects of *I.* are those which can be measured by a pecuniary value, and to this fair estimate of loss, *I.* by individuals on their own lives is the only exception; a case in which no mischief can arise from the insured valuing his life at the sum for which he can pay the premium of *I.* In this contract, the person who insures is called the *Insurer*, and technically the *Underwriter*, from his writing his name (in marine *I.*) under the sum he will stand good for. The party obtaining the *I.* is called the *Insured*, or the *Assured*, and the deed by which the insurer becomes bound is called a *Policy of Insurance.* — It is the duty of government to assist, by every means in its power, the efforts of individuals to protect their property. Losses do not always arise from accidental circumstances, but are frequently occasioned by the crimes and misconduct of individuals; and there are no means so effectual for their prevention, when they arise from this source, as the establishment of a vigilant system of police, and of such an administration of the law as may be calculated to afford those who are injured a ready and cheap method of obtaining every practicable redress, and, as far as possible, of insuring the punishment of culprits. But, in despite of all that may be done by government, and of the utmost vigilance on the part of individuals, property must always be exposed to a variety of casualties from fire, shipwreck, and other unforeseen disasters; and hence the importance of inquiring how such unavoidable losses, when they do occur, may be rendered least injurious. The loss of a ship, or the conflagration of a cotton-mill, is a calamity that would press heavily even on the richest individual. But were it distributed among several individuals, each would feel it proportionally less; and provided the number of those among whom it was distributed were very considerable, it would hardly occasion any sensible inconvenience to any one in particular. Hence the advantage of combining to lessen the injury arising from the accidental destruction of property; and it is the diffusion of the risk of loss over a wide surface, and its valuation, that forms the employment of those engaged in *I.*

Though it be impossible to trace the circumstances which occasion those events that are on that account termed accidental, they are, notwithstanding, found to obey certain laws. The number of births, marriages, and deaths; the proportions of male to female, and of legitimate to illegitimate births; the ships cast away; the houses burnt; and a vast variety of other apparently accidental events, — are yet, when our experience embraces a sufficiently wide field, found to be nearly equal in equal periods of time; and it is easy, from observations made upon them, to estimate the sum which an individual should pay, either to guarantee his property from risk, or to secure a certain sum for his heirs at his death. It must, however, be carefully observed that no confidence can be placed in such estimates unless they are deduced from a very wide induction. Suppose, for example, it happens that during the present year one house is accidentally burnt, in a town containing 1,000 houses; this would afford very little ground for presuming that the *average* probability of fire in that town was 1 to 1,000. For it might be found that not a single house had been burnt during the previous 10 years, or that 10 were burnt during each of these years. But supposing it were ascertained that, at an average of 10 years, 1 house had been annually burnt, the presumption that 1 to 1,000 was the real ratio of the probability of fire would be very much strengthened; and if it were found to obtain for 20 or 30 years together, it might be held, for all practical purposes at least, as indicating the precise degree of probability. — Besides its being necessary, in order to obtain the true measure of the probability of any event, that the series of events, of which it is one, should be observed for a rather lengthened period, it is necessary also that the events should be numerous, or of pretty frequent occurrence. Suppose it were found, by observing the births and deaths of 1,000,000 individuals taken indiscriminately from among the whole population, that the mean duration of human life was 40 years; we should have but very slender grounds for concluding that this ratio would hold in the case of the next 10, 20, or 50 individuals that are born. Such a number is so small as hardly to admit of the operation of what is called the *law of average.* When a large number of lives is taken, those that exceed the medium term are balanced by those that fall short of it; but when the number is small, there is comparatively little room for the principle of compensation, and the result cannot, therefore, be depended upon. It is found, by the experience of all countries in which censuses of the population have been taken with considerable accuracy, that the number of male children born is to that of female children in the proportion nearly of 22 to 21. But unless the observations be made on a very large scale, this result will not be obtained. If we look at particular families, they sometimes consist wholly of boys, and sometimes wholly of girls; and it is not possible that the boys can be to the girls of a single family in the ratio of 22 to 21. But when, instead of confining our observations to particular families, we extend them so as to embrace a population of 500,000, these discrepancies disappear, and we find that there is invariably a small excess in the number of males born over the females.

The false inferences that have been drawn from the doctrine of chances have uniformly, almost, proceeded from generalizing too rapidly, or from deducing a rate of probability from such a number of instances as do not give a fair average. But when the instances on which we found our conclusions are sufficiently numerous, it is seen that the most anomalous events, such as suicides, deaths by accidents, the number of letters put into the post-office without any address, etc., form pretty regular series, and consequently admit of being estimated *a priori.* — The business of *I.* is founded upon the principles thus briefly stated. Suppose it has been remarked that of *forty* ships, of the ordinary degree of seaworthiness, employed in a given trade, 1 is annually cast away, the probability of loss will plainly be equal to *one fortieth.* And if an individual wish to insure a ship, or the cargo on board a ship, engaged in this trade, he ought to pay a *premium* equal to $\frac{1}{40}$ of the sum he insures, exclusive of such an additional sum as may be required to indemnify the insurer for his trouble, and to leave him a fair profit. If the premium exceed this sum, the insurer is overpaid; and if it fall below it, he is underpaid.

I. are effected mostly by societies, and sometimes by individuals, the risk being in either case diffused amongst a number of persons. Companies formed for carrying on the business have generally a large subscribed capital, or such a number of proprietors as enables them to raise, without difficulty, whatever sums may at any time be required to make losses good. Societies of this sort do not limit their risks to small sums; that is, they do not often refuse to insure a large sum upon a ship, a house, a life, etc. The magnitude of their capitals affords them the means of easily defraying a heavy loss; and their premiums being proportioned to their risks, their profit is, at an average, independent of such contingencies. Individuals, it is plain, could not act in this way unless they were possessed of very large capital; and besides, the taking of large risks would render the business so hazardous, that few would be disposed to engage in it. — When cautiously conducted, the business of *I.* is as safe a line of speculation as any in which individuals can engage. To establish a policy of *I.* on a fair foundation, or in such a way that the premiums paid by the insured shall exactly balance the risks incurred by the insurers, and the various necessary expenses to which they are put, including, of course, their profit, it is necessary, as previously remarked, that the experience of the risks should be pretty extensive. It is not, however, at all necessary that either party should inquire into the circumstances that lead to those events that are most commonly made the subject of insurance. Such a research would, indeed, be entirely fruitless; we are, and must necessarily continue to be, wholly ignorant of the causes of their occurrence. — It is easy to perceive the immense advantages resulting to navigation and commerce from the practice of marine *I.* Without the aid that it affords, comparatively few individuals would be found disposed to expose their property to the risk of long and hazardous voyages; but by its means insecurity is changed for security, and the capital of the merchant, whose ships are dispersed over every sea, and exposed to all the perils of the ocean, is as secure as that of the agriculturist. He can combine his measures and arrange his plans as if they could no longer be affected by accident. The chances of shipwreck, or of loss by unforeseen occurrences, enter not into his calculations. He has purchased an exemption from the effects of such casualties, and applies himself to the prosecution of his business with that confidence and energy which nothing but a feeling of security can inspire. But, notwithstanding what has now been stated, it must be admitted that the advantages derived from the practice of insuring against losses by sea and land are not altogether unmixed with evil. The security which it affords tends to relax that vigilant attention to the protection of property which the fear of its loss is sure otherwise to excite. This, however, is not its worst effect. The records of our courts, and the experience of all who are largely engaged in the business of *I.*, too clearly prove that ships have been repeatedly sunk, and houses burned, in order to defraud the insurers. In despite, however, of the temptation to inattention and fraud which is thus afforded, there can be no doubt that, on the whole, the practice is, in a public as well as private point of view, decidedly beneficial. The frauds that are occasionally committed raise, in some degree, the rate of *I.* Still it is exceedingly moderate; and it is most probable that the precautions adopted by the *I.* offices for the prevention of fire, especially in great cities, where it is most destructive, outweigh the chance of increased conflagration arising from the greater tendency to carelessness and crime. The business of life *I.* has been carried to a far greater extent in Great Britain and in the U. States than in any other country, and has been productive of the most beneficial effects. Life *I.* are of various kinds. Individuals without any very near connections, and possessing only a limited fortune, are sometimes desirous, or are sometimes, from the necessity of their situation, obliged annually to encroach on their capitals. But should the life of such persons be extended beyond the ordinary term of existence, they might be totally unprovided for in old age; and to secure themselves against this contingency, they pay to an *I.* company the whole or a part of their capital, on condition of its guaranteeing them, as long as they live, a certain annuity, proportioned partly, of course, to the amount of the sum paid, and partly to their age when they buy the annuity. But though sometimes serviceable to individuals, it may be questioned whether *I.* of this sort are, in a public point of view, really advantageous. So far as their influence extends, its obvious tendency is to weaken the principle of accumulation; to stimulate individuals to consume their capitals during their own life, without thinking or caring about the interest of their successors. Were such a practice to become general, it would be productive of the most extensively ruinous consequences. Luckily, however, the species of *I.* now referred to is but inconsiderable compared with that which has accumulation for its object. All professional persons, or those living on salaries or wages, such as lawyers, physicians, military and naval officers, clerks in public or private offices, etc., whose incomes must of course terminate with their lives, and a host of others, who are either not possessed of capital or cannot dispose of their capital at pleasure, must naturally be desirous of providing, so far as they may be able, for the comfortable subsistence of their families in the event of their death. Take, for example, a physician or lawyer, without fortune, but making, perhaps, \$5,000 or \$10,000 a year by his business; and suppose that he marries and has a family: if this individual attain to the average duration of human life, he may accumulate such a fortune as will provide for the adequate support of his family at his

death. But who can presume to say that such will be the case, — that he will not be one of the many exceptions to the general rule? — And suppose that he were hurried into an untimely grave, his family would necessarily be destitute. Now, it is against such calamitous contingencies that life *I.* is intended chiefly to provide. An individual possessed of an income terminating at his death agrees to pay a certain sum annually to an insurance office; and this office binds itself to pay to his family at his death a sum equivalent, after deduction of the expenses of management and the profits of the insurers, to what these annual contributions, accumulated at compound interest, would amount to, supposing the insured to reach the common and average term of human life. Though he were to die the day after the *I.* has been effected, his family would be as amply provided for as it is likely they would be by his accumulations were his life of the ordinary duration. In all cases, indeed, in which those insured die before attaining the average age, their gain is obvious. But even in those cases in which their lives are prolonged beyond the ordinary term, they are not losers, — they then merely pay for a security which they must otherwise have been without. During the whole period, from the time when they effect their *I.* down to the time when they arrive at the mean duration of human life, they are protected against the risk of dying without leaving their families sufficiently provided for; and the sum which they pay after having passed this mean term is nothing more than a fair compensation for the security they previously enjoyed. Of those who insure houses against fire, a very small proportion only have occasion to claim an indemnity for losses actually sustained; but the possession of a security against loss, in the event of accident, is sufficient motive to induce every prudent individual to insure his property. The case of life *I.* is in this respect different. When established on a proper footing, the extra sums which those pay whose lives exceed the estimated duration is but the value of the previous security. In order to adjust the terms of an *I.* that the party insuring may neither pay too much nor too little, it is necessary that the probability of his life failing in each subsequent year should be determined with as much accuracy as possible. To ascertain this probability, various observations have been made in different countries and periods, showing, out of a given number of persons born in a particular country or place, how many complete each subsequent year, and how many die in it, till the whole be extinct. The result of such observations, when collected and arranged in a tabular form, are called "tables of mortality"; being entitled, of course, to more or less confidence, according to the number and species of lives observed; the period when, and the care with which, the observations were made, etc. But supposing these tables to be formed with sufficient accuracy, the expectation of life at any age, or its mean duration after such age, may be readily learned from them; and hence also the value of an annuity, or the assurance on a life of any age. (See INTEREST AND ANNUITIES.) In practice, a life *I.* is seldom made by the payment of a single sum when it is effected, but almost always by the payment of an *annual premium* during its continuance, the first being paid down at the commencement of the *I.* If the table of mortality adopted by the insurers fairly represents the law of mortality prevailing among the insured, it follows that when a party insured does not attain to the average age according to the table, the insurers will either lose by him or realize less than their ordinary profit; and when, on the other hand, the life of an insured party is prolonged beyond the tabular average, the profits of the insurers are proportionally increased. But if their business is so extensive as to enable the law of average fully to apply, what they lose by premature death will be balanced by the payments received from those whose lives are prolonged beyond the mean duration of life for the ages at which they were respectively insured; so that the profit of the society is wholly independent of chance.

In this part of the work Fire *I.* alone will be considered. The other two great divisions of the contract of *I.* must be looked for under LIFE *I.* (including accidents) and MARINE *I.* A variety of other information, directly or collaterally bearing upon the subject, will be found under the heads ANNUITY, AVERAGE, INTEREST AND ANNUITIES, RE-INSURANCE, REVERSION, etc.

Fire Insurance. *I.* against fire is a contract of indemnity, by which the insurer, in consideration of a certain premium received by him, either in a gross sum or by periodical payments, undertakes to indemnify the insured against all loss or damage he may sustain on his houses or other buildings, stock, goods, and merchandise, by fire up to a certain amount during a specified period. *I* against fire are generally made by joint-stock companies, in which certain persons owning the capital insure at their own risk and for their own profit. Many of these are established in New York, Boston, Philadelphia, and other important cities of the U. States, and operate by agencies throughout the country. There are also a great number of mutual companies (mostly doing local business), in which every one who is insured becomes thereby a member, and the net profits, or a certain proportion of them, are divided among all the members in such a manner as the charter or by-laws of the company may direct. Or both united, in which case there is a capital stock provided, as a permanent guaranty fund, over and above the premium received, and a certain part or proportion of the net profits is paid by way of dividend upon the fund, and the residue divided among the insured. — The conditions on which the different companies insure are contained in their *proposals*, and are also printed on the back of every policy; and it is in most instances expressly conditioned that they undertake to pay the loss, not exceeding the sum insured, "*according to the exact tenor of their printed proposals, or according to the conditions*" — Nothing can be recovered from the insurers, in the event of loss, unless the party insuring had an interest or property in the thing insured at the time when the insurance was effected, and when the loss happened. It often occurs that one office will not insure to the full amount required by an individual who has a large property; and in such case the party, to cover his whole interest, is obliged to insure at different offices. But, in order to prevent the frauds that might be practised by insuring the full value in various companies, there are, in the proposals issued by all the companies, articles which declare that persons insuring must give notice of any other *I* made elsewhere upon the same houses or goods, that the same may be specified and allowed by indorsement on the policy, in order that each office may bear its ratable proportion of any loss that may happen; and sometimes a clause is added, providing that unless such notice be given of each *I.* to the company where another *I* is made on the same effects, the *I.* made without such notice will be void. — Any trustee, mortgagee, reversioner, factor, or agent has sufficient interest in the goods under his custody to effect a policy of *I.*, provided the nature of such interest be distinctly specified at the time of executing such policy — The risk commences in general from the time the proposal is *accepted* by the company, unless there be some other time specified. — Policies of *I.* may be effected for any period. If for a year (which is most customary) or for a term of years by a single payment, it is usual for the office, by way of indulgence, to allow fifteen days after each year, or term of years, for the payment of the premium for the next period in succession; and provided the premium be paid within that time, the insured is considered within the protection of the office. — A policy of *I.* is not in its nature assignable, nor can it be transferred without the *express consent* of the office. When, however, any person dies, his interest remains in his executors or administrators respectively, who succeed or become entitled to the property, provided such representatives respectively procure their right to be indorsed on the policy. Insurers against fire are not held to pay for loss of profits, gains of business, or other indirect and remote consequences of a loss by fire. In marine *I.*, if a proportion only of the value is insured, the insured is considered as his own insurer for the residue,

and only an equal proportion of the loss is paid. Thus, if on a ship valued at $10,000, $5,000 be insured, and there is a loss of one half, the insurers pay only one half of the sum they insure, just as if some other party had insured the other $5,000. But in a fire policy, the insurers pay in all cases the whole amount which is lost by the fire, provided only that it does not exceed the amount which they insure. The general average clauses or provisions which are inserted in fire policies in England are not known here. — The companies insure generally against loss or damage by fire all descriptions of buildings, including mills and manufactories, and goods, wares, and merchandise in the same; ships in harbor or in dock; craft on navigable rivers and canals, and the goods laden on the same; cars travelling the roads and railroads, and their contents; and farming stock of all descriptions. — *I.* are generally divided into *common, hazardous, extra-hazardous*, etc., according to the nature of construction and surroundings of the buildings, trades which are carried on, etc., and the scale of premiums is materially affected by the nature of the risk; it is, therefore, extremely important that the insured should not deceive the insurers on this point. These rules are, however, usually liberally constructed. Thus if "storing" certain goods qualified hazardous demands an extra premium, having a small quantity for home consumption, and perhaps even for sale, does not come within the meaning of this clause. — The rates of premiums differing in most of the States, and being generally, chiefly of late, subject to frequent fluctuations, we purposely avoid giving any figures. — When the insured proposes to make any alteration in the premises insured, he should make this known to the insurers, and obtain their leave in writing. Mere alterations, however, if they do not substantially increase the risk, would probably not avoid a policy. — The risk insured against is fire, or ignition. To enable the insured to recover, something must have been actually on fire which ought not to have been on fire; and so the effects of heat radiating from fire in its proper place are not included. If there be ignition, however, though not of the subject insured, the injury occasioned by the event is within the policy, though more immediately caused by the efforts to protect the subject from the fire, as by water poured upon it, or the removal of furniture. A loss by lightning is not a loss by fire, unless the property be lost by ignition caused by the lightning. An explosion of or by gunpowder is a loss by fire, while it appears that an explosion of or by steam is not so. — The method and operation of fire *I.* have become quite uniform throughout the country, and any company may appeal to the usage of other companies to answer questions which have arisen under its own policy; only, however, within certain rules, and under some well-defined restrictions. In the first place, usage may be resorted to for the purpose of explaining that which needs explanation, but never to contradict that which is clearly expressed in the contract. And no usage can be admitted, even to explain a contract, unless the usage be so well established and so well known that it may reasonably be supposed that the parties entered into the contract with reference to it. Thus if under a policy against fire on a vessel in one part of this country, an inquiry is raised as to the local usage, the policy is not to be affected by proof of usage upon any particular matter in other parts of the world, or even of the U. States. And not only the terms of the contract must be duly regarded, but those of the charter; thus if this provides that "all policies and other instruments made and signed by the president, or other officer of the company, shall bind the company," an agreement to cancel the policy should be signed; although it cannot be doubted that a party insured might otherwise give up his policy, or renounce all claim under it, and that a valid agreement to that effect between him and the company would not be set aside for his benefit, on the ground of a merely formal defect. — The contract of fire *I.* being, to a great extent, ruled by the same principles which affect marine *I.*, so far as these are applicable to the nature of the contract, we refer to MARINE INSURANCE for further information. Reference is also given to any of the offices of the companies, or their agencies, where a particular account of the conditions on which *I.* are granted may be readily obtained.

Table showing the business transacted in the State of New York during the year 1878 by joint-stock Fire and Fire-marine Insurance Companies of that and other States and Foreign Countries, and by Mutual Companies of other States:—

COMPANIES.	Fire premiums received in 1878.	Fire losses paid in 1878.	Risks written.	Ratio of losses to	
				Risks written.	Premiums received.
	$	$	$		
New York Joint-stock Cos.....	7,850,325	2,652,833	1,679,090,799	18	34 91
Other States Joint-stock Cos..........	3,088,564	1,842,494	474,696,371	48	58.52
Other States Mutual Cos...	130,176	118,480	14,316,502	85	93 35
Am. Branches of Foreign Cos..	3,041,373	1,380,023	473,382,489	29	45.43

Each of the 165 American Companies authorized to transact business in the State of New York for the year 1878 has a special article at its alphabetical order in this work, and in the Appendix at end of the book.

Insurance Broker or **Agent**, a person whose business is to procure or effect marine, fire, or life insurances for the account of companies, from whom he receives a percentage or a commission on the business which they accept.

Insurance Co. of North America, a fire and marine insurance Co., located in Philadelphia, Pa., organized in 1794. *Statement*, Jan. 1, 1879: Cap. stock, paid up in cash, $2,000,000; net surplus, $2,480,078.93; total cap and surplus, $4,480,078.93; risks in force, fire, $172,402,661; marine and inland, $6,248,218; premiums, fire, $2,284,564.09; marine and inland, $290,632.26. Premiums received since the organization of the Co., $74,000,000; losses paid, $45,533,766.24; cash dividends paid to stockholders, $9,650,000.

Insurance Co. of the State of Pennsylvania, a fire and marine insurance Co., located in Philadelphia, Pa., organized in 1794. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000 (total net assets, $639,451.11; liabilities, including cap. stock paid up in cash, $424,708.01); net surplus, $214,743.10; total cap. and surplus, $414,743.10; risks in force, fire, $16,669,464, premiums, $146,127.66; marine and inland risks, $1,445,210, premiums, $35,778.77. Premiums received since the organization of the Co. (not given); losses paid, $12,000,000; cash dividends paid to stockholders, $3,956,406.

Intaglio, a name given to small gems in which the design is indented, or engraved, instead of being raised, as in cameos. It is the method employed in the engraving of seals.

Integer, a whole quantity or number, in contradistinction to a fractional part.

Intelligence Office, an office where information may be obtained; a servant's registry; a telegraph office, etc.

Intendant, in France, an inspector or superintendent.

Intense Blue, a preparation of refined indigo.

Intercourse, communication or correspondence; trade.

Interdict, a prohibition.

Interest and Annuities. In the commercial acceptation of the term, *I.* is the consideration agreed to be paid for the use of money. The sum on which the *I.* is reckoned is called the *Principal*, and the sum per cent agreed on as *I.*, the *Rate*. The latter, viewed apart from legislative interference, is in the general case determined by: 1st, the average rate of profit derived from the employment of capital; 2d, the security afforded for the repayment of the principal; and 3d, the duration or convertibility of the loan. That the rate of *I.* allowed on borrowed capital must, in the general case, bear a proportional relation to the average rate of profit yielded by its employment, seems evident. Much will be given for the use of money when much can be made of it; but, on the other hand, no man will pay more for its use than he has a prospect of making by its investment. Hence, in countries where the facilities for the advantageous employment of capital are great, *I.* is high; while in countries when these facilities are comparatively less, *I.* is low. In fact, the rate of *I.* is nothing more than the *net* profit on capital; whatever returns are obtained by the borrower, beyond the *I.* he has agreed to pay, really accrue to him on account of risk, trouble, or skill, or of

advantages of situation and connection. But besides fluctuations in the rate of *I.* caused by the varying productiveness of industry, the rate of *I.* on each particular loan must of course vary according to the supposed solvency of the borrowers, or the degree of risk supposed to be incurred by the lender, of either not recovering payment at all, or not recovering it at the stipulated term. No person of sound mind would lend on the personal security of an individual of doubtful character and solvency, and on mortgage over a valuable estate, at the same rate of *I.* Wherever there is risk, it must be compensated to the lender by a higher premium, or *I.* And yet, obvious as this principle may appear, all governments have interfered with the adjustment of the terms of loans ; some to prohibit *I.* altogether, and others to fix certain rates which it should be deemed legal to charge, and illegal to exceed. It is needless to waste the reader's time by entering into any lengthened arguments to show the inexpediency and mischievous effect of such interferences. This has been done over and over again. It is plainly in no respect more desirable to limit the rate of *I.* than it would be to limit the rate of insurance, or the prices of commodities ; and though it were desirable, it cannot be accomplished. The real effect of all legislative enactments having such an object in view is to increase, not diminish, the rate of *I.* When the rate fixed by law is less than the market or customary rate, lenders and borrowers are obliged to resort to circuitous devices to evade the law ; and as these devices are always attended with more or less trouble and risk, the rate of *I.* is proportionally enhanced. In England, a statute was passed in 1554 authorizing lenders to charge 10 per cent *I.* ; in 1624 the legal rate was reduced to 8 per cent ; and in the reign of Queen Anne it was further reduced to 5 per cent, at which it still continues. It is enacted by the statute (12 Anne c. 16) making this reduction, that " all persons who shall receive, by means of any corrupt bargain, loan, exchange, chevizance, or *I.* of any wares, merchandise, or other thing whatever, or by any deceitful way or means, or by any covin, engine, or deceitful conveyance for the forbearing or giving day of payment, for one whole year for their money or other thing, above the sum of £5 for £100, for a year, shall forfeit for every such offence the *treble* value of the moneys, or other things, so lent, bargained, etc." This enactment, which had been repeatedly condemned by committees of the English legislature, was at length substantially repealed by the Act 2 and 3 Vict. c. 37, which exempts bills of exchange not having more than 12 months to run, and contracts for loans of money above £10, from its operation.

The rate of *I.* and usury widely differ in the different States of the American Union. In Massachusetts, for instance, by act of March 6, 1867, it was enacted that " it shall be lawful to contract to pay or reserve discount at *any rate*, and to contract for payment and receipt of *any rate* of *I.* : provided, however, that no greater rate of *I.* than 6 per cent per annum shall be recovered in any action, except when the agreement to pay such greater rate of *I.* is in writing." In New York, on the other side, the act of June 20, 1879, reducing the rate of *I.* from 7 to 6 per cent from the 1st of January, 1880, has retained the old and heavy penalties of the usury laws of that State. The following statement shows the *I.* laws of the different States and Territories of the Union, with the penalty of usury : —

State.	Rate per cent. Legal.	Special.	Penalty of Usury.
Alabama	8	—	Loss of *I.*
Arizona	10	+*	None.
Arkansas	6	10	Forfeiture of prin. and *I.*
California	10	+	None.
Colorado	10	+	None.
Connecticut	6	6	None.
Dakota	7	12	Forf. of contract.
Delaware	6	6	Forf. of contract.
Dist. of Columbia.	6	10	Forf. of all *I.*
Florida	8	+	None.
Georgia	7	12	Forf. of all *I.*
Idaho	10	24	$100, or imprisonment 6 months, or both.
Illinois	6	8	Forf. of all the *I.* (Act of May 24, 1879).
Indiana	6	10	Forf. of *I.* over 10 per cent.
Iowa	6	10	Forf. of *I.* and costs.
Kansas	7	12	Forf. of excess over 12 per cent.
Kentucky	6	6	Forf. of excess of *I*
Louisiana	5	8	Forf. of *I.*
Maine	6	+	None.
Maryland	6	6	Forf. of excess.
Massachusetts	6	+	None.
Michigan	7	10	Forf. of excess.
Minnesota	7	12	Forf. of cont. if more than 12 per cent is charged.
Mississippi	6	+	Forf. of *I.* over 10 per cent.
Missouri	6	10	Fort. of all *I.*
Montana	10	+	None.
Nebraska	10	12	Forf. of all *I.* and costs.
Nevada	10	+	None.
New Hampshire	6	6	Forf. of three times the *I.* received.
New Jersey	6	6	Forf. of all *I.* and costs.
New Mexico	6	+	None.
New York State	6	6	Forf. of cont.; $1,000 fine ; 6 months' impris'ment.
North Carolina	6	8	Forf. of double am't of *I.*
Ohio	6	8	Forf. of excess.
Oregon	10	12	Forf of *I*, prin., and costs.
Pennsylvania	6	6	Forf. of excess.
Rhode Island	6	+	Forf, unless a greater rate is contracted.
South Carolina	7	7	Forf. of all the *I.*
Tennessee	6	6	Forf. of excess.
Texas	8	12	Forf. of all *I.*
Utah	10	+	None.
Vermont	6	7	Forf. of excess.
Virginia	6	6	Forf. of *I.* (no corporation can plead usury).
Washington Ter.	10	+	None.
West Virginia	6	6	Forf. of excess.
Wisconsin	7	10	Forf of all the *I.*
Wyoming	10	+	None.

* + no limit.

Distinction of Simple and Compound Interest. When a loan is made, it is usual to stipulate that the *I.* upon it should be regularly paid at the end of every year, half-year, etc. A loan of this sort is said to be at simple *I.* It is of the essence of such loan that no part of the *I.* accruing upon it should be added to the principal to form a new principal ; and though payment of the *I.* were not made when it becomes due, the lender would not be entitled to charge *I.* upon such unpaid *I.* Thus, suppose $100 were lent at simple *I.* at 5 per cent, payable at the end of each year ; the lender would, at the end of 3 or 4 years, supposing him to have received no previous payments, be entitled to $15 or $20, and no more. Sometimes, however, money or capital is invested so that the *I.* is not paid at the periods when it becomes due, but is progressively added to the principal ; so that at every term a new principal is formed, consisting of the original principal and the successive accumulations of *I.* upon *I.* Money invested in this way is said to be placed at *compound I.* It appears not unreasonable that when a borrower does not pay the *I.* he has contracted for, at the period when it is due, he should pay *I.* upon such *I.* This, however, is not allowed by law ; nor is it allowed to make a loan at compound *I.* But this rule is often evaded by taking a new obligation for the principal with the *I.* included, when the latter becomes due. Investments at compound *I* are also very frequent. Thus, if an individual buy into the funds, and regularly buy fresh stock with the dividends, the capital will increase at compound *I.* ; and so in any similar case.

Calculation of Interest. *I.* is estimated at so much per cent per annum, or by dividing the principal into 100 equal parts, and specifying how many of these parts are paid yearly for its use. Thus, 5 per cent, or 5 parts out of 100, means that $5 are paid for the use of $100 for a year, $10 for the use of $200 for the same period, and so on. Many attempts have been made to contrive expeditious processes for calculating *I.* The

following is one of the best: Suppose it were required to find the interest upon $172 for 107 days at 5 per cent. This forms what is called in arithmetical books a double-rule-of-three question, and would be stated as follows: —

$$\begin{array}{l} \$ \quad \text{days.} \quad \$ \quad\quad \$ \quad\quad \text{days.} \\ 100 \times 365 : 5 :: 172 \times 107 = \text{the interest required.} \end{array}$$

Hence, to find the *l.* of any sum for any number of days at any rate per cent, multiply the sum by the number of days, and the product by the rate, and divide by 36,500 (365 × 100); the quotient is the *l.* required. When the rate is 5 per cent, or $\frac{1}{20}$ of the principal, all that is required is to divide the product of the sum multiplied by the days by 7,300 (365, the days in a year, multiplied by 20). Five per cent *l.* being found by this extremely simple process, it is usual in practice to calculate 4 per cent *l.* by deducting $\frac{1}{5}$; 3 per cent by deducting $\frac{2}{5}$; $2\frac{1}{2}$ per cent by dividing by 2; 2 per cent by taking the half of 4, and so on.

In calculating *l.* upon accounts current, it is requisite to state the number of days between each receipt or payment, and the date (commonly the 31st of December) to which the account current is made up. Thus, $172 paid on the 15th of September, bearing *l.* to the 31st of December, 107 days. The amount of such *l.* may, then, be calculated as above explained, or by the aid of tables.

The 30th June is, after the 31st of December, the most usual date to which accounts current are made up, and *l.* calculated. It is desirable, in calculating *l.* on accounts current, to be able readily to find the number of days from one day in any month to any day in any other month. This may be done with the greatest ease by means of the following table: —

Table for ascertaining the Number of Days from any one Day in the Year to any other Day.

Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
1	32	60	91	121	152	182	213	244	274	305	335
2	33	61	92	122	153	183	214	245	275	306	336
3	34	62	93	123	154	184	215	246	276	307	337
4	35	63	94	124	155	185	216	247	277	308	338
5	36	64	95	125	156	186	217	248	278	309	339
6	37	65	96	126	157	187	218	249	279	310	340
7	38	66	97	127	158	188	219	250	280	311	341
8	39	67	98	128	159	189	220	251	281	312	342
9	40	68	99	129	160	190	221	252	282	313	343
10	41	69	100	130	161	191	222	253	283	314	344
11	42	70	101	131	162	192	223	254	284	315	345
12	43	71	102	132	163	193	224	255	285	316	346
13	44	72	103	133	164	194	225	256	286	317	347
14	45	73	104	134	165	195	226	257	287	318	348
15	46	74	105	135	166	196	227	258	288	319	349
16	47	75	106	136	167	197	228	259	289	320	350
17	48	76	107	137	168	198	229	260	290	321	351
18	49	77	108	138	169	199	230	261	291	322	352
19	50	78	109	139	170	200	231	262	292	323	353
20	51	79	110	140	171	201	232	263	293	324	354
21	52	80	111	141	172	202	233	264	294	325	355
22	53	81	112	142	173	203	234	265	295	326	356
23	54	82	113	143	174	204	235	266	296	327	357
24	55	83	114	144	175	205	236	267	297	328	358
25	56	84	115	145	176	206	237	268	298	329	359
26	57	85	116	146	177	207	238	269	299	330	360
27	58	86	117	147	178	208	239	270	300	331	361
28	59	87	118	148	179	209	240	271	301	332	362
29	...	88	119	149	180	210	241	272	302	333	363
30	...	89	120	150	181	211	242	273	303	334	364
31	...	90	...	151	...	212	243	...	304	...	365

By this table may be readily ascertained the number of days from any given day in the year to another. For instance, from the 1st of January to the 14th of August (first and last days included), there are 226 days. To find the number look down the column headed January, to No. 14, and then look along in a parallel line to the column headed August, you find 226, the number required. To find the number of days between any other two given days, when they are both after the 1st of January, the number opposite the first day must, of course, be deducted from that opposite to the second. Thus, to find the number of days between the 13th of March and the 19th of August, deduct from 231 — the number in the table opposite to 19 and under August — 72, the number opposite to 13 and under March, and the remainder, 159, is the number required, last day included. In leap years, *one* must be added to the number after the 28th of February.

When *l.*, instead of being simple, is compound, the first year's or term's *l.* must be found, and, being added to the original principal, makes the principal upon which *l.* is to be calculated for the second year or term; and the second year's or term's *l.*, being added to this last principal, makes that upon which *l.* is to be calculated for the third year or term; and so on for any number of years. But when the number of years is considerable, this process becomes exceedingly cumbersome and tedious, and to facilitate it tables have been constructed, for which see pages 599 to 602.

The first of these tables (p. 599) represents the amount of $1 accumulating at compound *l.*, at $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, and 6 per cent every year, from 1 year to 70 years, in dollars and decimals of a dollar. Now, suppose that we wish to know how much $500 will amount to in seven years at 4 per cent. In the column marked 4 per cent, and opposite to 7 years, we find $1.315931, which shows that $1 will, if invested at 4 per cent, compound *l.*, amount to $1.315931 in 7 years; and, consequently, $500 will, in the same time, and at the same rate, amount to $500 × 1.315931, or $657.966. For the same purpose of facilitating calculation, the present value of $1 due any number of years hence, not exceeding 70, at $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, and 6 per cent, compound *l.*, is given in the tables, pp. 600, 602. The use of these tables is precisely similar to the one above. Let it, for example, be required to find the present worth of $500 due 7 years hence, reckoning compound *l.* at 4 per cent; opposite to 7 years, and under 4 per cent, we find 75.291781, the present worth of $1 due at the end of 7 years; and multiplying this sum by $500, the product is $379.9589, the answer required.

Annuities.

Under the head Annuity we have given a brief account of that kind of property when viewed merely as a subject of commerce. In the present article we propose to explain briefly the principles of annuities, and to furnish some tables for the solution of the cases which most commonly occur in practice.

When a sum of money is to be paid yearly for a certain number of years, it is called an annuity. The annuities usually met with are either for a given number of years, which are called *annuities certain*; or they are to be paid so long as one or more individuals shall live, and are thence called *contingent annuities*.

By the amount of an annuity at any given time is meant the sum to which it will then amount, supposing it to have been regularly improved at compound interest during the intervening period.

The present value of an annuity for any given period is the sum of the present values of all the payments of that annuity. Nos. III. and IV. of the subjoined tables represent the amount and present value of an annuity of $1, reckoning compound interest at $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, and 6 per cent from 1 year to 70. The uses of these tables are numerous, and they are easily applied. Suppose, for example, it were required to tell the amount of an annuity of $50 a year for 17 years, at 4 per cent compound interest. Opposite to 17 (Table III. p. 601) in the column of years, and under 4 per cent, is 23.69751,239, being the amount of an annuity of $1 for the given time at the given rate per cent; and this multiplied by 50 gives $1,184.8756195, the amount required.

Suppose, now, that it is required what sum one must pay down to receive an annuity of $50, to continue for 17 years, compound interest, at 4 per cent. Opposite to 17 years (Table IV., p. 602), and under 4 per cent, is 12.16566.886, the present value of an annuity of $1 for the given time and at the given rate per cent; and this multiplied by 50 gives $608.283443, the present value required.

When it is required to find the *time* which must elapse, in order that a given sum, improved at a specified rate of compound interest, may increase to some other given sum, divide the latter sum by the former, and look for the quotient, or the number nearest to it, in Table No. I., under the given rate per cent, and the years opposite to it are the answer: thus, In what time will $523 amount to $1,087.2794, at 5 per cent, compound interest? Divide 1,087.2794, etc., by 523, and the quotient will be 2.0789, etc., which under 5 per cent in Table I. is opposite to 15 years, the time required.

If it had been required to find the time in which a given annuity, improved at a certain rate of compound interest, would have increased to some given sum, the question would have

been answered by dividing, as above, the given sum by the annuity, and, looking for the quotient not in Table No. I., but in Table No. III., under the given rate per cent, it would be found on a line with the time required, thus: A owes $1,000, and resolves to appropriate $10 a year of his income to its discharge; in what time will the debt be extinguished, reckoning compound interest at 4 per cent? 1,000 divided by 10 gives 100; the number in Table No. III. under 4 per cent, and nearest to this quotient, is 99.8265, etc., opposite to 41 years, the required time. Had the rate of interest been 5 per cent, the debt would have been discharged in somewhat less than 37 years. Of the abstract truth of the principle there cannot, indeed, be a doubt. But everything depends on the increasing sums annually produced being immediately invested on the same terms; and this, when the sum is large and the period loug, is altogether impracticable.

Let it next be required to find an annuity which, being increased at a given rate of compound interest during a given time, will amount to a specified sum: in this case we divide the specified sum by the amount of $1 for the time and rate given, as found in Table III., and the quotient is the answer. Thus: What annuity will amount to $1,087.2794 in 15 years at 5 per cent compound interest? Opposite to 15 years in Table III., and under 5 per cent, is 21 5785, etc., the amount of $1 for the given time and rate; and dividing 1,087 2794, etc., by this sum, the quotient, 50.387, etc , is the annuity required. *Deferred annuities* are those which do not commence till after a certain number of years; and *reversionary annuities*, such as depend upon the occurrence of some uncertain event, as the death of an individual, etc. The present value of a deferred annuity is found by deducting from the value of an annuity for the whole period the value of an annuity to the term at which the reversionary annuity is to commence. Thus: What is the present value of an annuity of $50 to continue for 25 years, commencing at 7 years from the present time, interest at 4 per cent? According to Table No. IV., the value of an annuity of $1 for 25 years at 4 per cent is $15 62207,995, and that of $1 for 7 years is $6.00205,467, which being deducted from the other, leaves $9.62002,528, which multiplied by 50 gives $481, the answer required.

Perpetual Annuities. When an annuity continues payable, without termination, it is called a perpetual annuity, or perpetuity. Of the five quantities considered under the last head, two, namely, the amount and the time, fall necessarily to be discarded, as in perpetual annuities they become infinite, and consequently unassignable. The three quantities remaining to be noticed are, 1. the annuity; 2. the rate of interest; and, 3. the present value of the annuity, or the principal, which, being immediately laid out, will yield annually and perpetually a sum equal to the annuity.

The simple interest of any sum for a year being what may be produced annually by that sum, without increasing or diminishing it, must be evidently equal to the perpetual annuity of which such sum will be the present value And as while the rate continues the same the annual interests produced by any two sums are to each other as the principals which produced them, it follows that at 5 per cent, 5 : 1 : : 100 : 100 ÷ 5 = 20; therefore, when the rate is 5 per cent, the value of the perpetual annuity is 20 years' purchase. In the same manner, when interest is at 4 per cent, 4 : 1 : : 100 : 100 ÷ 4 = 25: and the perpetual annui y is worth 25 years' purchase. And it follows, that in every case the value of a perpetual annuity may be found by dividing any sum by its interest for one year. This being premised, the solution of the three following cases becomes nearly self evident.

Annuity and Rate given, to find the Principal or Present Value. *Rule.* Divide the annuity by the rate, and the quotient will be the principal or present value required. *Ex.* Required the value of an estate of which the yearly rent is $1,500, reckoning interest at 3 per cent per annum.

$1,500 ÷ .03 = $50,000.

Principal or Present Value and Rate given, to find the Annuity. *Rule.* Multiply the present value by the rate, and the product will be the annuity. *Ex.* A gentleman purchases an estate for $14,000; at what yearly rent must he let it in order to have 4 per cent per annum upon the price?

$14,000 × .04 = $560.

Principal or Present Value and Annuity given, to find the Rate. *Rule.* Divide the annuity by the present value. *Ex.* An estate which cost $5,000 is let for $150 per annum; what rate of interest has the purchaser on the price?

$150 ÷ $5,000 = .03, or 3 per cent.

When, as is assumed throughout the present article, the interest is convertible into principal at the same terms as the annuity is payable, no difference arises in the valuation of perpetual annuities from the circumstance of the instalments being payable twice a year, as the annuity divided by the rate of interest for one year must always produce the same quotient as half the annuity divided by half the annual rate of interest.

For *Life Annuities*, see LIFE INSURANCE.

Interim, the mean-time; the interval between two periods.

Interjoist, a middle joist or cross-beam.

Interlacing, mixed or joined together.

Interleave, to place blank leaves of paper, in binding, between the printed leaves or sheets of a book.

Interlineation, additions or corrections made in manuscript between the previously written lines.

Interlocution, an intermediate act or decree before final decision.

Interlude, a farce or light piece performed at a theatre between the first play and the after-piece.

Intermediate, interposed, lying between.

Internal Revenue, that branch of the Treasury of the U. States whose object is to collect, in the form of internal duties, specific and ad valorem, taxes imposed on various kinds of manufactures, stamp duties, taxes on banks and bankers, etc. The laws of internal revenue of interest for manufacturers and traders are given in this work under the heads BREWER (for fermented liquors), SPIRITS, STAMPS, and TOBACCO.

The receipts from the several sources of taxation under the internal revenue laws for the years 1877 and 1878, are shown in the following table: —

Sources.	1877	1878.
Spirits	$57,469,429.72	$50,420,815.80
Tobacco	41,106,546.92	40,091,754.67
Fermented liquors	9,480,789.17	9,937,051 78
Banks and bankers	3,829,729.33	3,492,031.85
Penalties, etc	419,999.41	346,007.55
Adhesive stamps	6,450,429.15	6,380.405.13
Back taxes under repealed laws	238,260.55	429,658.71
Total	$118,995,184.25	$111,097,725.49

International and Great Northern R.R. runs from Longview to Houston, Tex., 236 m., and from Palestine to Austin City, 181 m.; with branches from Troupe to Minneola, 44.30 m.; from Phelps to Huntsville, 8 m.; and from Houston to Columbia, 50 m.; total, 519.30 m. This Co., whose offices are in Palestine, Tex., was formed by the consolidation, in 1873, of the Houston and Great Northern and the International R.R. Cos. In 1878 the road was, at the suit of the 2d mortgage bondholders, placed in a receiver's hands. The Co. has received from the State of Texas a land grant of 500,000 acres, which is vested by purchase in the Texas Land Co, of which the R.R. Co. holds 8,000 of the 10,000 shares. *Financial statement:* Cap. stock, $5,500,000; funded debt, $12,307,000; coupons overdue, funded, $2,458,000, not funded, $784,310. *Funded debt in detail:* 1st mortgage (International), issued 1871, $3,264,000, payable 1911, interest 7 % (Apr. and Oct.); 1st mortgage (Houston and Great Northern), issued 1872, $4,084,000, payable 1900, interest 7 % (Jan. and July); 2d mortgage (International), issued 1874, $739,000, payable 1904, interest at 8 % (Feb. and August); 2d mortgage (Houston and Great Northern), issued 1874, $1,427,000, payable 1904, interest 8 % (Feb. and Aug.); convertible (International), issued 1872, $1,555,000, payable 1892, interest 8 % (Feb. and Aug.); convertible (Houston and Great Northern), issued 1872, $1,238,000, payable 1892, interest 8 % (Feb. and Aug.).

Interoceanic, lying between two seas; a communication connecting two oceans, — as a railroad, a road, etc.

I.—*Table showing the Amount of $1 improved at Compound Interest, at 2½, 3, 3½, 4, 4½, 5, and 6 per cent, at the end of every year, from 1 to 70.*

Years	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	1.02500,000	1.03000,000	1.03500.000	1.04000,000	1.04500,000	1.05000,000	1.06000.000
2	1 05062,500	1.06090,000	1.07122,500	1.08160,000	1.09202,500	1.10250,000	1.12360,000
3	1.07689,062	1.09272,700	1.10871,787	1.12486,400	1.14116,612	1.15762,500	1.19101,600
4	1.10381,289	1.12550,881	1.14752,300	1.16985,856	1.19251,860	1.21550,625	1.26247.696
5	1.13140,821	1.15927,407	1.18768,631	1.21665,290	1.24618,194	1.27528,156	1.33822,558
6	1.15969,342	1.19405.230	1.22925,533	1.26531,902	1.30226,012	1.34009,564	1 41851,911
7	1.18868,575	1.22987,387	1.27227,926	1.31593,178	1.36086,183	1.40710,042	1.50363,026
8	1.21840,290	1.26677,008	1.31680,904	1.36856.905	1.42210,061	1.47745,544	1.59384,807
9	1.24886,297	1.30477,318	1.36289,735	1.42331,181	1.48609,514	1.55132,822	1 68947,896
10	1.28008,454	1.34391,638	1.41059,876	1.48024,428	1.55296,942	1.62889,463	1.79084,770
11	1.31208,666	1.38423,387	1.45996,972	1.53945,406	1.62285,305	1.71033,936	1 89829,856
12	1.34488,882	1.42576,089	1.51106,866	1.60103,222	1.69588,143	1.79585,633	2.01219,647
13	1.37851,104	1.46853.371	1.56395,606	1.66507,351	1.77219,610	1.88564,914	2.13292,826
14	1.41297,382	1.51258,972	1.61869,452	1.73167,645	1.85194.492	1.97993,160	2.26090,396
15	1.44829,817	1.55796,742	1.67534,883	1.80094,351	1.93528,244	2.07892,818	2.39655,819
16	1.48450,562	1.60470,644	1.73398,604	1.87298,125	2.02237,015	2.18287,459	2.54035,168
17	1.52161,826	1.65284,763	1.79467,555	1.94790,050	2.11337,681	2.29201.832	2.69277,279
18	1.55965,872	1.70243 306	1.85748,920	2.02581,652	2.20847,877	2.40661,923	2.85433,915
19	1.59865,019	1.75350,605	1.92250,132	2.10684,918	2.30786,031	2.52695,020	3.02559,950
20	1.63861,644	1.80611,123	1.98978,886	2.19112,314	2.41171,402	2.65329,771	3.20713,547
21	1.67958,185	1.86029,457	2.05943,147	2.27876,807	2.52024,116	2.78596,259	3.39956,360
22	1.72157,140	1.91610,341	2.13151,158	2.36991,879	2.63365,201	2.92526,072	3.60353,742
23	1.76461,068	1.97358,651	2.20611,448	2.46471,555	2.75216,635	8.07152,376	3.81974,966
24	1.80872,595	2.03279,411	2.28332,849	2.56330,417	2.87601,383	3.22509,994	4.04893,464
25	1.85394,410	2.09377,793	2.36324,498	2.66583,633	3.00543,446	3.38635,494	4.29187,072
26	1.90029,270	2.15659,127	2.44595,856	2.77246,979	3.14067,901	3.55567.269	4.54938,296
27	1.94780,002	2.22128,901	2.53166,711	2.88336,858	3.28200,956	3.73345,632	4.82234,594
28	1.99649,502	2.28792,768	2.62017,696	2.99870,332	3.42969,999	3.92012,914	5.11168,670
29	2.04640,739	2.35656,551	2.71187,798	3.11865,145	3.58403.649	4.11613,560	5.41838,790
30	2.09756,758	2.42726,247	2.80679,370	3.24339,751	3.74531,813	4.32194,258	5.74349,117
31	2.15000,677	2.50000,035	2.90503,148	3 37313,341	3.91385,745	4.53803.949	6 08810,064
32	2.20375,694	2.57508,276	3.00670,759	3.50805,875	4.08998,104	4.76494,147	6.45338,668
33	2.25885,086	2.65233,524	3.11194,235	3.64838,110	4.27403,018	5.00318,854	6.84058,988
34	2.31532,213	2.73190,530	3.22086,033	3.79431,634	4.46636,154	5.25334,797	7 25102,528
35	2.37320,519	2.81386,245	3.33359,045	3.94608,899	4.66734,781	5.51601,537	7.68608,679
36	2.43253,532	2.89827.833	3.45026,611	4.10393,255	4.87737 846	5.79181,614	8 14725,200
37	2.49334,870	3.98522,668	3.57102,543	4.26808,986	5.09686,049	6.08140,694	8 63608,712
38	2.55568,242	3.07478,348	3.69601,132	4.43881,345	5.32621,921	6.38547,729	9.15425,235
39	2.61957,448	3.16702,698	3.82537,171	4.61636,599	5.56589,908	6.70475,115	9.70350,749
40	2.68506,384	3.26203,779	3.95925,972	4.80102,063	5.81636,454	7.03998,871	10.28571,794
41	2.75219,043	3.35989.893	4.09783,381	4.99306,145	6.07810,094	7.39198,815	10.90286,101
42	2.82099,520	3.46069,589	4.24125,799	5.19278,391	6.35161,548	7.76158,755	11.55703,267
43	2.89152,008	3.56451,677	4.38970,202	5.40049,527	6.63743,818	8.14966.693	12.25045,463
44	2.96382,808	3.67145,227	4.54334,160	5.61651,508	6.93612,290	8.15715,028	12.98548,191
45	3.03790,328	3.78159,584	4.70235,855	5.84117,568	7.24824,848	8.98500,779	13.76461,083
46	3.11385,086	3.89504,372	4.86694,110	6.07482,271	7.57441,961	9.43425,818	14.59048,748
47	3 19169,713	4.01189,503	5.03728,404	6.31781,562	7.91526,849	9.90597,109	15.46591,673
48	3.27148,956	4.13225,188	5.21358,898	6.57052,824	8.27145,557	10.40126,965	16.39387,173
49	3.35327,680	4.25621,944	5.39606,459	6.83334,937	8.64367.107	10.92133,313	17.37750,403
50	3.43710,872	4.38390,602	5.58492,686	7.10668,335	9.03263,627	10.46739,978	18.42015,427
51	3.52303,644	4.51542,320	5.78039.930	7.39095,068	9.43910,490	12.04076,977	19.52536,353
52	3.61111,235	4.65088,590	5.98271,327	7.68658,871	9.86386,463	12.64280,826	20.69688,534
53	3.70139,016	4.79041,247	6.19210,824	7.99405,226	10.30773,853	13.27494,868	21.93869,846
54	3.79392,491	4.93412,485	6.40883,202	8.31381,435	10.77158,677	13.93869,611	23.25502,037
55	3.88877,303	5.08214,859	6.63314,114	8.64636,692	11.25630,817	14.63563,092	24.65032,159
56	3.08599,236	5.23461,305	6.86530,108	8.99222,160	11.76284,204	15.36741,246	26.12934,089
57	4.08564,217	5.39165,144	7.10558,662	9.35191,046	12.29216,993	16.13578,308	27.69710,134
58	4.18778,322	5.55340,098	7.35428,215	9.72598,688	12.84531,758	16.94257,224	29.35892,742
59	4.29247,780	5.72000,301	7.61168,203	10.11502,636	13.42335,687	17.78970,085	31.12046,307
60	4.39978,975	5.89160,310	7.87809,090	10.51962,741	14.02740,793	18.67918,589	32.98769,085
61	4.50978,419	6.06835,120	8.15382.408	10.94041,251	14.65864,129	19.61314,519	34.96695,230
62	4.62252,910	6.25040,173	8.43920,793	11.37802,901	15.31828,014	20.59380,245	37.06496,944
63	4.73809,233	6.43791,379	8.73458,020	11 83315,017	16.00760,275	21.62349,257	39.28886,761
64	4.85654,464	6.63105,120	9.04029,051	12.30647,617	16.72794,487	22.70466,720	41.64619,967
65	4.97795,826	6.82998,273	9.35670,068	12.79873,522	17.48070,239	23.83990,056	44.14497,165
66	5.10240,721	7.03488,222	9.68418,520	13.31068.463	18.26733,400	25.03189,559	46.79366,994
67	5.22996,739	7.24592,868	10.02313,168	13.84311,201	19.08936,403	26.28349,036	49 60129,014
68	5.36071,658	7.46330,654	10.37394,129	14.39683,649	19.94838,541	27.59766,488	52 57736,755
69	5.49473,449	7.68720,574	10.73702,924	14.97270,995	20.84606.276	28.97754,813	55.73200,960
70	5.63210,286	7.91782,191	11.11282,526	15.57161,835	21.78413,558	30.42642,553	59.07593,018

II.— *Table showing the Present Value of $1 receivable at the end of any given year, from 1 to 70, reckoning Compound Interest at 2½, 3, 3½, 4, 4½, 5, and 6 per cent.*

Years.	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	0.97560,976	0.97087,379	0.96618,357	0.96153.846	0.95693,780	0.95238,095	0.94339,623
2	.95181,440	.94259,591	.93351,070	.92455,621	.91572,995	.90702,948	.88999,644
3	.92859,941	.91514,166	.90194,270	.88899,636	.87629,660	.86383,760	.83961,928
4	.90595,064	.88848,705	.87144,223	.85480,419	.83856,134	.82270.247	.79209,366
5	.88385,429	.86260,878	.84197,317	.82192,711	.80245,105	.78352,616	.74725,817
6	.86229,687	.83748,426	.81350,064	.79031,453	.76789,574	.74621,540	.70496,054
7	.84126,524	.81309,151	.78599,096	.75991,781	.73482,846	.71068,132	.66505,711
8	.82074,657	.78940,923	.75941,156	.73069,020	.70318,513	.67683,936	.62741.237
9	.80072,836	.76641,673	.73373,097	.70258.674	.67290,443	.64460,892	.59189,846
10	.78119,840	.74409,391	.70891,881	.67556,417	.64392,768	.61391,325	.55839,478
11	.76214,478	.72242,126	.68494,571	.64958,093	.61619,874	.58467,929	.52678,753
12	.74355,589	.70137,988	.66178,330	.62459,705	.58966,386	.55683,742	.49696,936
13	.72542,038	.68095,134	.63940,415	.60057,409	56427,164	.53032,135	.46883,902
14	.70772,720	.66111,781	61778,179	.57747,508	.53997,286	.50506,790	.44230,096
15	.69046,556	.64186,195	.59689,062	.55526,450	.51672,044	.48101,710	.41726,506
16	.67362,493	.62316,694	.57670,591	.53390,818	.49446,932	.45811,152	.39364,628
17	.65719,506	.60501.615	.55720.378	.51337,323	.47347,639	43629,669	.37136,442
18	.64116,594	.58739,461	.53836,114	.49362,812	.45280,037	.41552.065	.35034,379
19	.62552,772	.57028,603	.52015.569	47464,242	.43330,179	.39573,396	.33051,301
20	.61027,094	.55367,575	.50256,588	.45638,695	.41464,286	.37688,948	.31180,473
21	.59538,629	.53754,928	.48557,090	.43883.360	39678,743	.35894,236	.29415,540
22	.58086,467	.52189,250	.46915,063	.42195,539	.37970,089	.34184,987	.27750,510
23	.56569,724	.50669,175	.45328,563	.40572,633	.36335,013	.32557,131	.26179,726
24	.55287,535	.49193,374	.43795,713	.39012,147	.34770,347	.31006,791	.24697,855
25	.53939,059	.47760,556	.42314,699	.37511,680	.33275,000	.29530,277	.23299,863
26	.52623,472	.46369,473	.40883,767	.36068,923	.31840,248	.28124,073	.21981,003
27	.51330,973	.45018,906	.39501,224	.34681,657	.30469,137	.26784,832	.20736,795
28	.50087,778	.43707,675	.38165,434	.33347,747	.29157,069	.25509,364	.19563,014
29	.48836,125	.42434,636	.36674.815	.32065,141	.27901.502	.24294,632	18455,674
30	.47674,269	.41198,676	.35627,841	.30831,867	.26700,001	.23137,745	.17411,013
31	.46511,481	.39998,714	.34423,035	.29646,026	.25550,241	.22035,947	.16425,484
32	.45377,055	.38833,703	.33258,971	.28505.794	.24449,991	.20986,617	.15495,740
33	.44270,298	.37702,625	.32134.271	.27409,417	.23397,121	.19987,254	.14618,622
34	.43190,534	.36604,490	.31047,605	.26355,209	.22389,589	.19035,480	.13791,153
35	.42137,107	.35538,340	.29997,686	.25341,547	.21425,444	.18129,029	.13010,522
36	.41109,372	.34503,243	.28983,272	.24366,872	.20502,817	.17265,741	.12274,077
37	.40106,705	.33498,294	.28003.161	.23429,685	.19619,921	.16443,563	.11579,318
38	.39128,492	.32522,615	.27056,194	.22528,543	.18775,044	.15660,536	.10923,885
39	.38174,139	.31575,355	.26141,250	.21662.061	.17966 549	.14914,797	.10305,552
40	.37243,062	.30655,684	.25257,247	.20828,904	.17192,870	.14204,568	.09722,219
41	.36334,695	.29762,800	.24403.137	.20027,792	.16452,507	.13528,160	.09171,905
42	.35448,483	.28895,922	.23577,910	.19257,493	.15744.026	.12883.962	.08652.740
43	.31583,886	.28054,294	.22780,590	.18516,820	.15066,054	.12270,440	.08162,962
44	.33740,376	.27237,178	.22010,231	.17804,635	.14417,276	.11686,133	.07700,908
45	.32917,440	.26443,862	.21265,924	.17119,841	.13796,437	.11129,651	.07265,007
46	.32114,576	.25673,652	.20546.787	.16461.386	.13202 332	.10599,668	.06853,781
47	.31331,294	.24925,877	.19851,968	.15828,256	.12633,810	.10094,921	.06465,831
48	.30567,116	.24199,880	.19180,645	.15219,476	.12089,771	.09614,211	.06099,840
49	.29821,576	.23495,029	.18532,024	.14634,112	.11569,158	09156,391	.05754,566
50	.29094,221	.22810,708	.17905,337	.14071,262	.11070,965	08720,373	.05428,836
51	.28384,606	.22146.318	.17299,843	.13530,059	.10594 225	.08305,117	.05121,544
52	.27692,293	.21501,280	.16714,824	.13009,672	.10138,014	.07909,635	.04831,645
53	.27016,876	.20875,029	.16149,589	.12509,300	.09701.449	.07532,986	.04558,156
54	.26357,928	.20267.019	.15603,467	.12028,173	.09283 683	.07174,272	.04300,147
55	.25715,052	.19676,717	.15075,814	.11565,551	.08883,907	.06832,640	.04056,742
56	.25087.855	.19103,609	.14566,004	.11120.722	.08501,347	.06507,276	.03827,115
57	.24475,957	.18547,193	.14073,433	.10693,002	.08135,260	.06197.406	.03610,486
58	.23878,982	.18003,984	.13597,520	.10281,733	.07784,938	.05902,291	.03406,119
59	.23296,568	.17482,508	.13137,701	.09886,282	.07449,701	.05621,230	.03213,320
60	.22728,359	.16973,309	.12693,431	.09506,040	.07128,901	.05353,552	.03031,434
61	.22174,009	.16478,941	.12264,184	.09140,423	.06821,915	.05098.621	.02859,843
62	.21633,179	.15998,972	.11849,453	.08788,868	.06528.148	.04855,830	.02697,965
63	.21105,541	.15532.982	.11448,747	.08450,835	.06247,032	.04624,600	.02545,250
64	.20590,771	.15080,565	.11061,591	.08125,803	.05978,021	04404,381	.02401,179
65	.20088,557	.14641,325	.10687,528	.07813,272	.05720,594	.04194,648	.02265,264
66	.19598.593	.14214,879	.10326,114	.07512,760	.05474.253	.03994,903	.02137,041
67	.19120,578	.13800,853	.09976,922	.07223,809	.05238,519	.03804,670	.02016,077
68	.18654,223	.13398,887	.09639,538	.06945,970	.05012,937	.03623,495	.01901,959
69	.18199,242	.13008,628	.09313,563	.06678,818	.04797,069	.03450,948	.01794,301
70	.17755,358	.12629,736	.08998,612	.06421,940	.04590,497	.03286,617	.01692,737

III. — *Table showing the Amount of Annuity of $1 per Annum, improved at Compound Interest, at 2½, 3, 3½, 4, 4½, 5, and 6 per cent at the end of each year, from 1 to 70.*

Years.	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	1.00000,000	1.00000,000	1.00000,000	1.00000,000	1.00000,000	1.00000,000	1.00000,000
2	2.02500,000	2.03000,000	2.03500,000	1 04000,000	2.04500,000	2.05000,000	2.06000,000
3	3.07562,500	3.09090,000	3.10622,500	3.12160,000	3.13702,500	3.15250,000	3.18360,000
4	4.15251,562	4 18362,700	4.21494,287	4.24646 400	4.27819,112	4.31012,500	4 37461.600
5	5.25632,852	5.30913,581	5.36246,588	5.41632,256	5.47070,973	5.52563,125	5.63709,296
6	6.38773,673	6.46840,988	6.55015.218	6.63297,546	6.71689,166	6.80191.281	6.97531,854
7	7.54743,015	7.66246.218	7.77940,751	7.89829,448	8.01915,179	8.14200,845	8.39383,765
8	8.73311,590	8.89233,605	9.05168,677	9.21422,626	9.38001,362	9.54910,888	9.89746,791
9	9.95451,880	10.15910,613	10.36849,581	10.58279,531	10.80211,423	11.02656,432	11.49131,598
10	11.20338,177	11.46387,931	11.73139,316	12.00610,712	12.28820,937	12.57789,254	13.18079,494
11	12.48346,631	12.80779,569	13.14199,192	13.48635,141	13.84117,879	14.20678,716	14.97164,264
12	13.79555,297	14.19202.956	14.60196,164	15.02580,546	15.46403,184	15.91712,652	16.86994,120
13	15.14044,179	15.61779,045	16.11303,030	16.62683,768	17.15991,327	17.71298,285	18.88213.767
14	16.51895,284	17.08632,416	17.67698,636	18.29191,119	18.93210,937	19.59863,199	21.01506.593
15	17.93192,666	18.59891,389	19.29568,088	20.02358,764	20.78405,429	21.57856,359	23.27596,988
16	19.38022,483	20 15688,130	20.97102,971	21.82453,114	22.71933,673	23.65749,177	25.67252,808
17	20.86473,045	21 76158,774	22.70501,575	23.69751,239	24.74170,689	25.84036,636	28.21287,976
18	22.38634,871	23.41443,577	24.49969,130	25.64541,288	26.85508,370	28.13238,467	30.90565,255
19	23.94600,743	25.11686,844	26.35718,050	27.67122,940	29.06356,246	30.53900,391	33.75999,170
20	25.54465,761	26.87037,449	28.27968,181	29.77807,858	31.37142,277	33.06595,410	36.78559,120
21	27.18327,405	28.67648,572	30.26947,068	31.96920.172	33.78313,680	35.71925,181	39 99272,668
22	28.86285,590	30.53678,030	32.32890,215	34 24796,979	36.30337,795	38.50521,440	43.39229,028
23	30.58442,730	32 45288,370	34.46041,373	36.61788,858	38.93702,996	41.43047,512	46.99582.769
24	32.34903,798	34.42647,022	36 66652,821	39.08260,413	41.68919,631	44.50199,887	50.81557,735
25	34.15776,393	36.45926,432	38.94985,669	41.64590,830	44.56521,014	47.72709,882	54.86451,200
26	36.01170,803	38 55304,225	41.31310,168	44.31174,463	47.57064,460	51.11345,376	59.15638 272
27	37.91200,073	40.70963,352	43.75906,024	47.08421,441	50.71132,361	54.66912,645	63.70576,568
28	39.85980,075	42.93092,252	46.29062,734	49.96758,299	53.99333 317	58.40258,277	68.52811.162
29	41 85629,577	45.21885,020	48.91079,930	52.96628,631	57.42503,316	62.32271,191	73.63979,832
30	43.90270,316	47.57541,571	51.62267,728	56.08493,776	61.00706,966	66.43884,750	79.05818,622
31	46.00027,074	50.00267,818	54.42947,098	59.32833,527	64.75238,779	70.76078 988	84.80167,739
32	48.15027,751	52.50275,852	57.33450,247	62.70146,868	68.66624,524	75.29882.936	90.88977,803
33	50.35403,445	55.07784,128	60.34121,005	66.20952,743	72.75622,628	80.06377,083	97.34316,471
34	52.61288,531	57.73017,652	63.45315,240	69.85790,853	77.03025,646	85.06695,937	104.18375,460
35	54.92820,744	60.46208,181	66.67401,274	73.65222,487	81.49661,800	90.32030,734	111.43477,987
36	57.30141,263	63 27594.427	70.00760,318	77.59831,387	86.16396,581	95.83632,271	119.12086,666
37	59.73394,794	66.17422,259	73.45786,930	81.70224,642	91.04134,427	101.62813,884	127.26811,866
38	62.22729,664	69.15944,927	77.02889,472	85.97033,628	96.13820,476	107.70954,579	135.90420,578
39	64.78297,906	72.23423,275	80.72490,604	90.40914,973	101.46442,398	114.09502,308	145.05845,813
40	67.40255,354	75.40125,973	84.55027,775	95.02551,572	107.03032,306	120.79977,423	154.76196,562
41	70.08761,737	78.66329,753	88.50953,747	99.82653,635	112.84668,759	127.83976,294	165.04768,356
42	72.83980,781	82.02319,645	92.60737,128	104.81959,780	118.92478 854	135.23175,109	175.95054,457
43	75.66080,300	85.48389,234	96.84862,928	110.01238,171	125.27640,402	142.99333,864	187.50757,724
44	78.55232,308	89.04840,911	101.23833,130	115,41287,698•	131.91384,220	151.14300,558	199.75803,188
45	81.51613,116	92.71986,139	105.78167,290	121.02939,206	138.84996,510	159.70015,586	212.74351,879
46	84.55403,443	96.50145,723	110.48403,145	126.87056,774	146.09821.353	168.68516,365	226.50812,462
47	87.66788,529	100.39650,095	115.35097,255	132.94539,045	153.67263,314	178.11942,185	241.09861,209
48	90.85958,243	104.40839,598	120.38825,659	139.26320,607	161.58790,163	188 02539,292	256.56452,882
49	94.13107,199	108.54064,785	125.60184,557	145 83373,431	169.85935,720	198.42666,257	272.95840,055
50	97.48434,879	112.79686,729	130.99791,016	152.66708,368	178.50302,828	209.34799,570	290 33590,458
51	100 92145,751	117.18077,331	136.58283,702	159.77376,703	187.53566,455	220.81539,548	308.75605,886
52	104.44449,395	121.69619,651	142.36323,631	167.16471,771	196.97476,946	232.85616,528	328.28142,239
53	108.05560,629	126.34708,240	148.34594,958	174.85130,642	206 83863,408	245.49897,352	348.97830,773
54	111.75699,645	131.13749,488	154.53805,782	182.84535,868	217.14637,261	258.77392,220	370.91700,620
55	115.55092,136	136.07161,972	160.94688,984	191.15917,302	227.91796,938	272.71261,831	394.17202,657
56	119.43969,440	141.15376,831	167.58003,099	199.80553,994	239.17426,755	287.34824,922	418.82234,816
57	123.42568,676	146.38838.136	174 44533,207	208.79776 154	250.93710,959	302.71566,168	444.96168,905
58	127.51132,898	151.78003,280	181.55091,869	218.14967,200	263.22927,953	318.85144,477	472.64879,039
59	131.69911,215	157.33343,379	188.90520,085	227.87565,888	276.07459,710	335.79401,700	502.00771,782
60	135.99158,995	163.05343,680	196.51688,288	237.99068,524	289.49795,397	353.58371,785	533.12818,089
61	140.39137,970	168.94503,991	204.39497,378	248.51031,265	303.52536,190	372.26290,375	566.11587,174
62	144.90116,419	175.01339,110	212.54879,786	259.45072,516	318.18400,319	391.87604,893	601.08282 404
63	149.52369,330	181.26379,284	220.98800,579	270.82875,416	333.50228,333	412.46985,138	638.14779,349
64	154 26178,563	187.70170,662	229.72258,599	282 66190,433	349.50968,608	434.09334.396	677.43666,110
65	159.11833,027	194.33275,782	238.76 87,650	294.96838,050	366.23783,096	456.79801,115	719.08286,076
66	164.09628,853	201.16274,055	248.11957,718	307.76711,572	383.71853,335	480.63791,170	763.22783,241
67	169.19869,574	208.19762,277	257.80376,238	321.07780.035	401.98586,735	506.66960,729	810.02150.235
68	174.42866,313	215.44355,145	267.82689,406	334 92091,236	421.07523,138	531.95329,765	859.62279,249
69	179.78937,971	222 90685,800	278.20083,535	349.31774,886	441.02981,679	559.55096,254	912.20016,004
70	185.28411,421	230 59406,374	288.93786,459	364.29045,881	461.86967.955	588.52851,066	967.93216,964

IV.— *Table showing the Present Value of an Annuity of $1 per Annum, to continue for any given number of years, from 1 to 70, reckoning Compound Interest at 2½, 3, 3½, 4, 4½, 5, and 6 per cent.*

Years.	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	0.97560,976	0.97087,379	0.96618,357	0.96153,846	0.95693,780	0.95238,095	0.94339,623
2	1.92742,415	1.91346,969	1.89969.427	1.88609,467	1.87266,775	1.85941,043	1.83339,267
3	2 85602,356	2.82861,135	2.80163,698	2.77509,103	2.74896,435	2.72324,803	2.67301,195
4	3.76197 421	3.71709,840	3.67307,921	3.62989,522	3.58752,570	3.54595,050	3.46510.561
5	4.64582,849	4.57970,719	4.51505,237	4.45182,233	4.38997,674	4.32947,667	4.21236,378
6	5.50812,536	5.41719,144	5.32855,302	5.24213,686	5.15787,248	5.07569,207	4 91732,432
7	6.34939,060	6.23028,245	6.11454,398	6 00205,467	5.89270,094	5.78637,340	5.58238,144
8	7.17013,717	7 01969,219	6.87395,553	6.73274,488	6.59588,607	6.46321,276	6.20979,381
9	7.97086,553	7.78610,892	7.60768.651	7.43533,161	7.26879,049	7.10782.167	6.80169,227
10	8.75206,393	8.53020,284	8.31660,532	8.11089,578	7.91271,818	7.72173,493	7.36008,705
11	9.51420,871	9.25262,410	9.00155,103	8.76047,671	8.52891,692	8.30641,422	7.88687,457
12	10.25776,460	9.95400.3 8	9.66333,433	9.38507.376	9.11858,078	8.86325,164	8.38384,393
13	10.98318,497	10.63495,532	10.30273,848	9.98564,785	9.68285,242	9.39357,299	8.85268,295
14	11.69091,217	11.29607,312	10.92052,027	10.56312,293	10.22282.528	9.89864,094	9.29498,392
15	12.38137,773	11.93793,507	10.51741,089	11.11838,744	10.73954,573	10.37965,804	9.71224,898
16	13.05500,266	12.56110,201	12.09411,681	11.65229,561	11.25401,505	10.83776,956	10.10589,526
17	13.71219,772	13 16611,845	12.65132,058	12.16566,886	11.70719,143	11.27406,625	10.47725,968
18	14.35336.363	13.75351.306	13.18968,172	12.65929,698	12 15999 180	11.68958,690	10.82760,347
19	14.97889,134	14.32379,909	13.70983,741	13 13393,940	12.59329,359	12.08532,086	11.15811,648
20	15.58916,228	14.87747,484	14.21240,330	13.59032,635	13.00793,645	12.46221,034	11.46992,121
21	16.18454,857	15.41502,412	14.69797,420	14.02915,995	13.40472,388	12.82115,271	11.76407,661
22	16.76543,824	15.93691,662	15.16712,483	14.45111,534	13.78442,476	13.16300,258	12.04158,171
23	17.33214,048	16.44360,837	15.62041,047	14.85684,167	14 14777,489	13.48857,388	12.30337,897
24	17.88498,583	16.93554,210	16.05836,760	15.24696,314	14.49547,837	13.79864,179	12.55035,752
25	18.42437,642	17.41314,766	16.48151,459	15.62207,995	14.82820,896	14.09394,457	12.78335,615
26	18.95061,114	17.87684,239	16.89035,226	15.98276,918	15.14661.145	14.27518,530	13.00316.618
27	19.46401,087	18.32705,145	17.28536,450	16.32958,575	15 45130,282	14.64303,362	13 21053,413
28	19.96488,865	18.76410,820	17.66701,884	16.66306,322	15.74287.351	14.89812,726	13.40616,428
29	20.45354,991	19 18845,456	18.03576,700	16.98371,464	16 02188,853	15.14107,358	13.59072,101
30	20.93029,259	19.60044,132	18.39204,541	17.29203,350	16.28888,854	15.37245,103	13.76483,115
31	21.39540,741	20.00042,847	18.73627,576	17.58849,356	16.54439,095	15.59281,050	13.92908,599
32	21.84917,796	20.38876,550	19.06886,547	17.87355,150	16.78889,086	15.80267,667	14.08404,338
33	22.29188,093	20.76579,175	19.39020,818	18.14764,567	17.02286,207	16.00254,921	14.23022,961
34	22.72378,628	21.13183,665	19.70068,423	18.41119,776	17.24675,796	16.19290,401	14.36814,114
35	23.14515,734	21.48722,004	20.00066,109	18.66461,323	17.46101,240	16.37419,429	14.49824,636
36	23.55625,107	21.83225,247	20.29049,381	18.90828,199	17.66604,058	16 54685,171	14.62098,713
37	23.95751,811	22.16723,541	20.57052,542	19.14257,880	17.86223,979	16.71128,734	14.73678,031
38	24.34860,304	22.49246,156	20.84108,736	19.36786,424	18.04999,023	16.86789,271	14.84601.916
39	24.73034,443	22.80821,510	21.10249,987	19.58448,484	18.22965,572	17.01704,067	14.94907.468
40	25.19277,505	23.11477,195	21.35507,234	19.79277,389	18.40158,442	17.15908,636	15.04629,687
41	25.46612,200	23.41239,995	21.59910,371	19 99305,181	18.56610,949	17.29436,796	15.13801,591
42	25.82060,683	23.70135,917	21.83488,281	20.18562,674	18.72354,976	17.42320,758	15.22454,331
43	26.16644,569	23.98190,211	22.06268,870	20.37079,494	18.87421,029	17.54591,198	15 30617,294
44	26.50384,945	24.25427,389	22.28279,102	20.54884,129	19.01838,306	17.66277,331	15.38318,202
45	26.83302,386	24.51871,251	22.49545,026	20.72003,970	19.15634,742	17.77406,982	15.45583,209
46	27.15416,962	24.77544.904	22.70091,812	20.88465,356	19.28837,074	17 88006,650	15.52436,990
47	27.46748,255	25.02470,780	22.89943,780	21.04293,612	19.41470,884	17.98101,571	15.58902,821
48	27.77315.371	25.26670,660	23.09124,425	21.19513,088	19.53560,655	18.07715,782	15 65002,661
49	28.07136,947	25.50165,689	23.27656,449	21.34147,200	19.65129,813	18.16872,173	15.70757,227
50	28.36231,168	25.72976,397	23.45561,787	21.48218,462	19.76200,778	18.25592,546	15.76186,063
51	28.64615,774	25.95122,716	23.62861,630	21.61748,521	19.86795,003	18.33897,663	15.81307,607
52	28.92308,072	26.16623,996	23.79576,454	21.74758,193	12.96933.017	18.41807.298	15 86130,252
53	29.19324,948	26.37499,025	23.95726,043	21.87267,493	20.06634,466	18.49340,284	15 90697,407
54	29.45682,877	26.57766,043	24.11329,510	21.99295,667	20.15918,149	18.56514,556	15.94997,554
55	29.71397,928	26.77442,761	24.26405,323	22.10861,218	20.24802,057	18.63347,196	15.99054,296
56	29.96485,784	26.96540,370	24.40971,327	22.21981,940	20.33303,404	18.69854,473	16.02881,412
57	30.20961,740	27.15093,563	24.55044,760	22.32674,943	20.41438.664	18.76051,879	16.06491,898
58	30.41840,722	27.33100,546	24.68642,281	22.42956,676	20.49223,602	18.81954,170	16.09898,017
59	30.68137,290	27.50583,055	24.81779,981	22.52842,957	20.56673,303	18.87575,400	16.13111,336
60	30.90865,649	27.67556.364	24.94473,412	22.62348,997	20.63802,204	18.92928,953	16.16142,770
61	31.13039,657	27.84035,304	25.06737,596	22 71489,421	20.70624,119	18.98027,574	16.19002,613
62	31.34672,836	8.00034,276	25.18587,049	22.80278,289	20.77152,267	19.02883,404	16.21700,579
63	31.55778,377	28.15567,258	25.30035,796	22.88729,124	20.83399,298	19.07508,003	16 24245,829
64	31.76369,148	28.30647,823	25.41097,388	22.96854,927	20.89377,319	19.11912,384	16.26647,008
65	31.96457,706	28.45289,149	25.51784,916	23.04668,199	20.95097,913	19.16107,033	16.28912,272
66	32.16056,298	28.59504,028	25.62111,030	23 12180,959	21.00572,165	19.20101,936	16.31049,313
67	32.35176,876	28.73304,881	25.72087,951	23.19404,768	21.05810,685	19.23906,606	16.33065,390
68	32.53831,099	28.86703,768	25.81727,489	23 26350,739	21.10823,622	19.27530,101	16.34967,349
69	32.72030,341	28.99712,396	25.91041,053	23.33029,556	21.15620,691	19 30981,048	16.36761,650
70	32.89785,698	29.12342,132	26.00039,664	23.39451,497	21.20211,187	19.54267,665	16.38454,387

Interpolate, to add to an original; to alter a book or manuscript.

Interpreter, a linguist; a translator of languages in law courts, or for travellers, etc.; one who explains between two parties.

Intersect, to divide into parts; to meet and cross each other.

Interstice, a small intervening space; the space between one thing and another.

Intertie, horizontal timber framed between two posts.

Interview, a meeting of parties; a conference.

Interweave, to insert together; to intermix or unite in texture or construction.

Intestate, dying without having made a will.

Intimation, an indirect suggestion or notice given; a declaration or remark.

Intoxicate, to make drunk.

Introduce, to bring into notice or practice.

Introduction, a preface or preliminary dissertation to a book. — The act of bringing into a country. — Ushering an individual into the presence of another personally or by letter.

Intruder, one who forces his way in uninvited; one who enters a manufactory or place of business without permission previously obtained.

Inulin, a starch obtained from the dandelion and other plants.

Invalid, weak, worn out, or disabled. — Of no weight or cogency.

Invalidity, the absence of legal right; informality.

Invalid's Chair, a chair for wheeling out infirm or sick persons in the open air; or a chair capable of assuming and retaining any required position, from the erect to the prone.

Invention, the action or operation of inventing, or of finding out something new; the contrivance of that which did not before exist. *Invention* is the creation or construction of something which has not before existed; *discovery* is the making manifest something which has hitherto been unknown. Galileo invented the telescope; Harvey discovered the circulation of the blood. — The skill or ingenuity displayed in the contrivance of anything new.

Inventor, a contriver; a discoverer or maker of something new.

Inventory, a schedule or list of the goods, wares, and merchandise, credits, and assets of a merchant, made out in minute detail, each article being set down separately, and separately valued according to its then actual cash value; the whole list being then entered in a book called an inventory book. Some merchants make out inventories more frequently, but usually they are made out at the close of each year. — *T. McElrath.*

Inverness. See GREAT BRITAIN (Seaports).

Investigation, a searching inquiry.

Investigator, an examiner; one charged to look into anything, as the state of affairs of a company or firm.

Investment, money put out at interest in some public stock or association, or in the purchase of houses or land, etc.

Invoice, a mercantile document containing a description of goods sold or consigned, with an account of the charges, if any, that are made against the buyer or consignee. Inland *I.* are generally made out in the form of bills of parcels, containing in the title the place, date, and names of the parties. Shipping or exportation *I.* are usually headed with a short account of the goods, the names of the vessel and captain, the port of destination, the name of the consignee, and a specification of the account on which the goods are sent. All exportation *I.*, whose total value is not under $100, must be certified by an American consul.

An exportation *I.*, carelessly prepared, or worded without due regard to the requisites of the American custom-house regulations, is perhaps the most frequent source of difficulties in the entry of imported goods. Importers can easily guard themselves against the vexatious difficulties, harassing delays, and even losses, resulting from a defective *I.*, by giving careful attention to the *Consular Regulations relating to the Authentication of I.*, prescribed by the President of the U. States, Oct. 1, 1870, that we here give in full: —

All *I.* of importations from countries in which there are such officers, must, before shipment of the merchandise, be produced to and authenticated by the U. States Consular Officer nearest the place of shipment for the U. States. — By the place of shipment, is meant the place where the merchandise has been manufactured, finished, or finally prepared for exportation, and where the journey to the U. States commences; and is not necessarily the place where it is actually put on board ship. Countries adjacent to the U. States are excepted from the above rules. The authentication *there* may be by the Consular Officer at or nearest to the port or place of clearance for the latter. — All such *I.* must be triplicate; the three copies to be regarded as *one I.*, and subject to only one charge for consular certificate. — The authentication must be by certificate under the consular seal, and must be either indorsed on each copy of the invoice, or attached by tape, cord, or ribbon, passed under the seal in such manner as to secure integrity. The certificate must state that the *I.* has been produced to the officer certifying; also the date of such production, the name and identity of the person producing, and the intended port of destination of the merchandise in the U. States, as declared by such person. It is desirable that it should also, as far as practicable, indicate the facts in regard to market values at the principal markets of the country, of all merchandise the duty on which is in any respect or part based on such values. — The act of March 3, 1865, fully recognizes the solemnity of these certificates, and the importance of consular fidelity in regard to them; but Consular Officers are not to consider themselves authorized under its provisions absolutely to withhold their certificates, *even* when they believe the cost or market values set forth in the *I.* to be too low; but in such cases they will, on due investigation, certify on the *I.* what, in their opinion, is such true market value, and let the importer take the hazard of satisfying Customs Officers of the contrary. — To facilitate this, it is recommended that every *I.* should, upon its face, at the right-hand margin, have a blank column for "consular corrections of *I.*;" in which, when he deems it necessary, the Consul may enter in figures what he regards as the true values at the principal markets of the country, and certify accordingly, as set forth in Forms. — It is the duty of Consular Officers to acquaint themselves as thoroughly as possible with market values at the principal markets of their districts; with the weights, measures, tares, bounties, etc., there used; and in general with all requisites to enable them to certify intelligently. They may retain *I.* for a reasonable time for proper inquiry.

To judge correctly the market value of any given article, it will often be important to inquire carefully as to prices in sales thereof for other markets than our own. When the U. States are the principal consumers, and fictitious sales to create nominal values are detected, Consuls should ascertain the actual cost of production, and add the customary percentage for profits. In such cases especial care is enjoined as to certificates. — They will, in all proper cases, require samples of the merchandise to be deposited with them, especially when the invoice descriptions of merchandise are not specific and full enough to enable them, or Customs Officers, intelligently to judge of the market value without inspection of the merchandise itself. It is particularly enjoined upon Consular Officers at London, Manchester, Leeds, Glasgow, Belfast, Paris, Lyons, Zurich, Basle, Aix-la-Chapelle, Berlin, Leipsic, Dresden, Vienna, Frankfort, and Brussels, *generally* to require samples of all merchandise imported from there, of a nature to be sampled. All samples must be accompanied by a card or statement, which, if practicable, shall be attached thereto, containing the particulars indicated on the Form prescribed by the Department, including the certificate at the bottom thereof, which must be signed by the shipper or his agent; and samples of textiles must be of such size as may be indicated by the proper revenue officer of the Treasury Department. All samples must be carefully preserved, together with the cards or statements accompanying them, and must not be suffered to be inspected or seen by others than officers or agents of the Government, except in cases of exhibition for the purpose of ascertaining or establishing the market value or price; in which case the name of the shipper will not be made known. — Every *I.* must be signed by the owners or shippers

of the merchandise invoiced, if the same has been actually purchased; or by the manufacturers or owners, if the same has been otherwise obtained; or, if in either case this is impracticable, then by a duly authorized agent. — It must, when produced to the Consul, be indorsed with a declaration signed by such purchaser, manufacturer, owner, or agent, setting forth (*a*) That it is in all respects true. (*b*) That no different *I.* of the articles therein mentioned has been, or will be furnished to any one. (*c*) That it sets forth the actual quantity, respectively, of all articles therein named, which are subject to specific duty. (*d*) That as to all articles therein named, which are subject, either wholly or partly, to a duty based upon their value, *and obtained by purchase*, it contains a true and full statement of the time and place of purchase, their actual cost, and all charges upon them in the currency paid therefor; *and when otherwise obtained*, the actual market value thereof, respectively, at the principal markets of the country in which they were obtained or manufactured. (*e*) That no discounts, bounties, or drawbacks are contained in said *I.* but such as have been actually allowed. — This declaration on the part of the owner, manufacturer, purchaser, or agent, whether under oath or not, is the verification of the invoice before shipment, recognized and prescribed by the acts of March 3, 1863, and March 3, 1865, and must not be confounded with consular authentication. — The declaration should, if possible, be made by the actual owner, manufacturer, or shipper of the merchandise. No agent must be permitted to make this declaration, or otherwise verify the *I.*, without having first filed with the Consul a duly executed power of attorney, authorizing him to act for and bind his principal. — When a verification by oath or affirmation of the owner, shipper, manufacturer, or agent, is deemed necessary by the Consular Officer, the affiant may, in countries where an oath, to be of legal force, must be taken before a local magistrate, or other officer, take the same before any such officer. The language and form of the oath, if taken by foreigners, should be those of their country. For the authentication of a signature in these cases, the fee of two dollars, prescribed by the consular tariff, is to be charged. — Consular Officers are forbidden to be in any way interested in the fees, or to interfere with the selection of such magistrate, or other officer. They may, in their discretion, on points on which they are in doubt, examine experts and others, either on affidavit or orally, without charge or expense to the U. States Government. — One *I.* must not embrace merchandise shipped by two or more vessels. Every *I.* must truly state quantities in the weights and measures of the country or place from which the importations are made, without respect to those of the U. States, and should set forth the quantity by weight of all woollen, worsted, mohair, and mixed goods (excepting carpeting and bunting); also of cotton bagging, of crinoline, corset, and hat steel wire, and the quantity by weight, measure, or tale, respectively, of all other goods the duty of which is estimated partly on either weight, measure, or tale. — When the value of a foreign currency mentioned in the invoice is not fixed by U. States laws, as set forth in the "Table of Equivalents," or shall have depreciated, or have been debased subsequently to the passage of such laws, the invoice must be accompanied by a consular certificate, showing the value of such currency in U. States silver dollars. No such certificates are required as to invoices of Swiss goods, made out in the *franc federal;* the franc of France being the standard value thereof. — The Consular Officer must return one of the triplicates to the person producing them; file one in his office for careful preservation; and, as soon as practicable, transmit the remaining one directly to the collector of the port of destination of the merchandise, either by the master of the vessel in which shipment is made, or by mail, and without the intervention of any party in interest. — If a Consular Officer ascertains and has reliable evidence of the falsity of an oath, administered either by himself or by a local magistrate whose certificate he has authenticated, he should notify the Treasury Department; which will transmit to him the original *I.* and oath, to be used, if deemed expedient, in a prosecution for perjury. He should also promptly inform the Treasury Department, and the collector of the port to which goods may be destined, of all errors and frauds discovered in *I.* that have been certified by him.

CERTIFICATE TO INVOICE.

Foreign owner's oath, where goods, wares, or merchandise have been actually purchased.

I, ——— ———, do solemnly and truly swear, that the goods, wares, or merchandise described in the invoice now produced, and hereunto annexed, were actually purchased for my account, or for account of myself and partners in the said purchase: and that said invoice contains a true and faithful account of the actual cost thereof, and of all charges thereon; and that no discounts, bounties, or drawbacks, are contained in the said invoice but such as have been actually allowed on the same.

——— ———.

Sworn to and subscribed before me, at ———, the ——— day of ——— A. D., 18—, and of the independence of the United States the ———: and I do further certify, that I am satisfied that ——— ———, who subscribes the foregoing oath, is the person he represents himself to be; that he is a credible person; and that the statements made by him under said oath (or affirmation, as the case may be) are true.

——— ———,

[L. S.] *U. S. Consul.*

CERTIFICATE TO INVOICE

Foreign manufacturer or owner's oath, in cases where goods, wares, or merchandise have not been actually purchased.

I, ——— ———, of ———, do solemnly and truly swear, that the invoice now produced, and hereunto annexed, contains a true and faithful account of the goods, wares, or merchandise therein described at their market value at ———, at the time the same were (procured or manufactured, as the case may be), and of all charges thereon; and that the said invoice contains no discounts, bounties, or drawbacks, but such as have been actually allowed.

——— ———.

Sworn and subscribed before me, at ———, the ——— day of ———, A.D., 18—, and of the independence of the United States of America the ———: and I further certify, that I am satisfied that ——— ———, who subscribes the foregoing oath, is the person he represents himself to be; that he is a credible person: and that the statements made by him under said oath (or affirmation, as the case may be) are true.

——— ———,

[L. S.] *U. S. Consul.*

Invoice-Book, the book in which are copied or posted the originals of bills and invoices of merchandise purchased or received.

Involved, embarrassed by debts or liabilities.

Iodine, an elementary substance obtained by a chemical process from kelp, from soap-makers' black ash, or from the residuary kelp-liquor of the soap-boilers. It is soft and friable, of a bluish-black color, and metallic lustre, sp. gr. 4.946. It is extremely volatile. Its smell resembles that of diluted chlorine; its taste is acrid. It is slightly soluble in water, but dissolves readily in ether, alcohol, and in the aqueous solutions of hydriodic acid and of iodide of potassium. With starch, free *I.* produces a beautiful blue color, so that a solution of starch gives the best test for its presence. If the presence of a soluble iodide is suspected, a small quantity of chlorine-water added displaces the *I.* from combination, and renders it capable of acting upon the starch. It is said that *I.* may thus be detected when dissolved in one million parts of water. *I.* combines with hydrogen to form *hydriodic acid*, and with oxygen to form *iodic acid*. If finely powdered *I.* is put into caustic ammonia, it is in part dissolved; the remainder is left as a dark powder, the *iodide* of *nitrogen* which, on being separated by a filter and dried on bibulous paper, forms an exceedingly explosive compound, a slight jar or the touch of a feather being sufficient to explode it. *I.* forms compounds with many of the metals, some of which are remarkable for their brilliant colors, and others are of great value in the arts and in medicine. *I.* and most of its compounds are irritant poison. — *Imp.* duty: crude, free; resublimed, 75 cts. per lb.; salts of, 15 per cent.

I. O. U. (I owe you), an acknowledgment or indebtedness for money or goods lent.

Iowa, a Western State of the American Union, situated between lat. 40° 20′ and 43° 30′ N., lon 90° 12′ and 96° 38′ W. It is bounded N. by Minnesota, E. by the Mississippi, which separates it from Illinois and Wisconsin, S. by Missouri, and W. by the Missouri and Big Sioux Rivers, which separate it from Nebraska and Dakota. Greatest length from E. to W., 307 m.; greatest breadth, 196 m.; area, 55,045 sq. m. The State is divided into 99 counties. Des Moines, its capital, is a thriving city, situated at the head of navigation of the Des Moines River, 300 m W. of Chicago; pop. 20,000. The other principal cities of *I.* are: Burlington (pop. 25,000); Cedar Rapids (8,000);

Clinton (8,000); Council Bluffs (12,000); Davenport (25,000); Dubuque (26,000); Iowa City (8,000); Keokuk (14,000); Muscatine (8,500); Ottumwa (7,000); Waterloo (6,000). The total pop. of *I.*, which was 43,112 in 1840, 192,214 in 1850, 674,913 in 1860, and 1,194,020 in 1870, is now about 1,500,000.

The surface of *I.* is somewhat elevated and generally undulating. It has no mountains, nor even hills, of any great height. Table Mound, a conical elevation with a flat summit, three or four miles from Dubuque, is about 500 feet high. On the borders of the rivers there are frequent "bluffs," which are generally from 40 to 130 feet high. The highest ground in the State is a plateau in the N. W., called *Coteau des Prairies*, which enters it from Minnesota. The S. part of the State abounds with grassy lawns and verdant plains, intersected by numerous rivers, the chief of which are the Des Moines, the Skunk, the Iowa, and the Red Cedar (a branch of Iowa) Rivers, which flow into a S. E. direction into the Mississippi. The banks of almost all of these rivers are skirted with belts of wood. The distinguishing feature, however, of *I.* is its unique and admirably diversified prairies, sometimes spreading out into vast plains. From the scarcity of wood, the scenery becomes wearisome and tame. In the N. part, however, the surface is more elevated, the tops of hills are covered with towering oaks, and the rivers tumble over precipitous ledges and craggy rocks. The soil of *I.* is generally fertile, and of easy cultivation, and no State in the Union has a smaller proportion of inferior land. The climate is generally healthful, and highly favorable for agricultural operations. The peach generally blossoms in mid April, and wheat ripens early in August. The winter is occasionally severe, but the severity is not so great as is usual in the same latitude. The summer, also, is less oppressively hot. *I.* is essentially an agricultural country. Its fine prairies and rich natural pastures afford peculiar facilities for raising cattle and sheep. It produces more wheat than any other State in the Union, stands only second to Illinois in the production of Indian corn, and ranks third in the production of oats. Its climate and soil are also well adapted for the cultivation of flax, tobacco, castor-oil plant, etc. The relative value of its agricultural products is given in this work under the name of each of the principal crops. The raising of hogs is very extensive, and was a profitable occupation down to 1877, when the diseases of swine, the principal of which is called hog cholera, caused to breeders and farmers of *I.* a loss of nearly $3,500,000. There has been since but little abatement of the disease. The hogs packed in *I.* in 1877 amounted to 419 442; in 1878, to 436,850. In 1879 the State contained 15,541,793 acres of improved land on a total area of 35.228,800 acres. The total area in woodland was 4,985,-668 acres, of which 2,524,793 were included in farms. — The minerals of *I.* are not of great variety. The vast bituminous coal-field of the State occupies most of its central and southern portions. For upwards of 200 miles the River Des Moines passes through this great deposit, the area of which has been estimated at about 20,000 sq. m., embracing a country equal in extent to more than one half of the State of Indiana. The beds of coal, which are 100 feet in thickness, lie near the surface, and may be worked at small expense. The lead-mines of *I.* are a continuation of those of Illinois and Wisconsin; they are very rich. The only ones which have been worked are near the Mississippi, chiefly in the vicinity of Dubuque, and yield about 70 per cent of lead.—According to the last census the total number of manufacturing establishments in *I.* was 6,566, having 899 steam engines of 25,298 horse-power, and 726 water-wheels of 14,249 horse-power, and employing 25,032 hands. The capital invested amounted to $22,420,183; wages paid during the year, $6,893,292; value of materials, $27,682,096; products, $46,534,322, in which total flouring and grist mill products entered for $15,635,345. *I.* exports a considerable quantity of agricultural and mining products through the Atlantic and Gulf ports. Its shipping points are Burlington, Clinton, Davenport, Dubuque, Fort Madison, Keokuk, Muscatine, etc. The State has three U. States ports of delivery, Burlington, Dubuque, and Keokuk. In 1879, *I.* had 76 national banks in operation, with an aggregate paid-in capital of $5,927,000. There were, besides, 287 savings-banks and private bankers, having an aggregate capital of $5,255,013. — The amount of public land that has been approved and certified to the State of *I.* under the several grants of Congress is 8,000 000 acres, or nearly one fourth of the entire State. Of this amount, the State has conveyed to railroad companies, counties, and individuals entitled thereto, about 6,000,000 acres, leaving about 2,000,000 acres to be conveyed in the future. — The railroad system of *I.* has progressed with astonishing rapidity; the total mileage of main track having increased from 655 in 1860 to 4,265 in 1879. To this day the working of these roads has not been remunerative, which is partly owing to lavishness of expense in their construction. In 1879 the aggregate debts of the *I.* railroads were estimated at $64,744,418, or $15,574.80 per mile. The stock and debt amounted to $153,601,784, or $36,949.80 per mile. The following table exhibits the names of the lines lying wholly or partly within the State, the number of miles completed in *I* in 1879, and the entire length of the lines: —

Fig. 287. — Seal of Iowa.

Names of Companies.	Length of Line.	Length of Line in Iowa.
	Miles	Miles.
Burlington, Cedar Rapids, and Northern	412 33	402.27
Burlington and Northwestern	19.80	19.80
Burlington and Southwestern..........	142.34	79.60
Cedar Falls and Minnesota	75.58	75.58
Cedar Rapids and Missouri River	274.20	274.20
Central Railway of Iowa	190.64	190.64
Chicago, Burlington, and Quincy.......	1,283.75	506.28
Chicago, Clinton, and Western.........	208.10	183.20
Chicago, Clinton, Dubuque. and Minn..	10 00	10.00
Chicago, Iowa, and Nebraska....	82.40	82.40
Chicago, Milwaukee, and St. Paul.......	1,512.23	434 00
Chicago, Rock Island, and Pacific.......	635.96	446.25
Crooked Creek........................	8 00	8.00
Dakota Southern......................	61.50	5.83
Davenport and Northwestern...........	160 65	160.65
Des Moines, Adel, and Western.........	7.00	7.00
Des Moines and Fort Dodge............	87.20	87.20
Des Moines and Minneapolis............	56.73	56.73
Dubuque and Sioux City...............	142.89	142.89
Dubuque Southwestern	54.76	54.76
Fort Dodge and Fort Ridgely...........	12.75	12.75
Grinnell and Montezuma...............	13.63	13 63
Iowa Eastern.........................	19.10	19.10
Iowa Falls and Sioux City..............	183.69	183.69
Iowa Midland	68.80	68.80
Iowa Railway.........................	3.25	3.25
Iowa Southern and Missouri Northern..	347.43	177 !8
Kansas City, St. Jos., and Council Bluffs..	250.98	53.09
Keokuk and Des Moines................	1(2.20	162.20
Maple River..........................	60.15	60.15
Missouri, Iowa, and Nebraska	85 00	14.79
Newton and Monroe	17.00	17.00
St. L., Ottumwa, and C. R.............	43 30	43 30
Sioux City and Pacific................	107.42	80.47
Sioux City and Pembina...............	53 20	37.50
Sioux City and St. Paul...............	122 35	56 10
Stanwood and Tipton..................	8.50	8 50
Toledo and Northwestern..............	3 00	3 00
Waukon and Mississippi...............	23.00	23.00

Iowa Falls and Sioux City R.R. runs from Iowa Falls to Sioux city, Ia., 183.69 m. This Co., whose offices are in Cedar Rapids, Ia., opened the road in 1870, and leased it from its opening to the Illinois Central R.R. Co., for the net earnings and a drawback of 10% on all business to and from their line passing over the Dubuque and Sioux City R.R.; also a rental from the Sioux City and St. Paul R.R. Co. *Financial statement:* Cap. stock, $4,625,000; funded debt $2,952,000, consisting of 1st mortgage bonds, issued in 1869, payable in 1917, interest 7% (April and October).

Iowa Midland R.R. runs from Lyons to Anamosa, Ia., 68.80 m. This Co., whose offices are in Chicago, is controlled by the Chicago and North-Western R.R. Co., which indorsed and sold the bonds. *Financial statement:* Cap. stock, $84,947 50; funded debt, $1,350,000, consisting of 1st mortgage 8% bonds issued in 1870, payable in 1900, guaranteed principal and interest by the Chicago and North-Western R.R. Co.

Iowa Southern and Missouri Northern R.R. runs from Washington, Ia., to Leavenworth, 270 45 m., with the following branches: Des Moines to Indianola, Ia. (originally the Des Moines, Indianola, and Missouri R.R.), 21.40 m.; Summerset to Winterset, Ia. (originally the Des Moines, Winter-

set, and South-Western R.R.), 26.50 m.; and the Atchison Branch, Chicago, and South-Western R.R., 29.08 m., making a total of 347.43 m. of road. The Missouri Kansas Bridge and the Fort Leavenworth R.R., both owned by separate Cos., but controlled by stock held by the Chicago, Rock Island, and Pacific R.R. Co., are included in the main line of this Co. This Co., whose offices are in Chicago, Ill., leased the road in perpetuity to the Chicago, Rock Island, and Pacific R.R. Co., which guarantees $5,000,000 of bonds, and holds nearly all the stock.

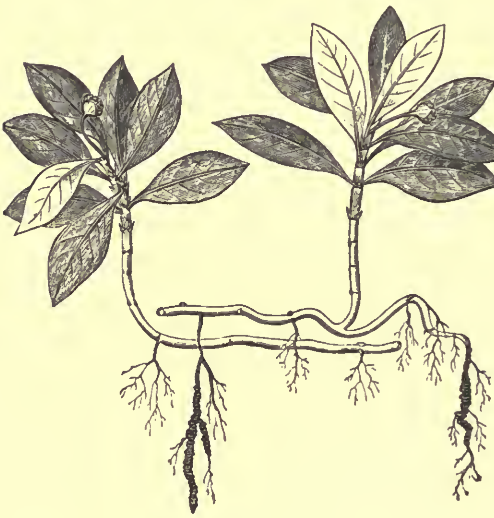

Fig. 288.—IPECACUANHA.

Financial statement, 1878: Cap. stock, $3,200,000; funded debts, $5,000,000, consisting of 1st mortgage 7 % bonds issued in 1869, payable in 1890, guaranteed by the Chicago, Rock Island, and Pacific R.R. Co. Interest on bonds paid as rental, $350,000.

Ipecacuanha, a medicinal root derived from several plants growing in S. America. The best is the annulated, yielded by a small shrubby plant, *Cephaelis ipecacuanha* (Fig. 228), found in moist situations in Brazil and Colombia. It occurs brown, red, and gray, or grayish-white. This kind, sometimes called Brazilian or Lisbon ipecacuan, is exported from Rio Janeiro in bales and barrels. The root is in short pieces, of the thickness of a goose-quill, with numerous circular depressions or clefts, and much twisted; and having a central woody fibre, surrounded by a cortical part, in which its virtues chiefly reside; the larger, theref ore, its relative proportions the better. Another kind, black and weaker, the product of the *Psychotria emetica*, a native of Peru, is sometimes exported from Carthagena. The primary effect of *I.* is that of stimulating the stomach. If the dose be sufficiently large, it acts as an emetic, a purpose for which it is much employed. *Imp.* free.

Ireland. See GREAT BRITAIN.

Iridioscope, an optical instrument which shows the inside of the eye.

Iridium, a rare, brittle, whitish metal, found in combination with platinum and osmium. When carefully polished it resembles platinum. Being a very hard substance, it is used for tipping or pointing metallic pens. The value of *I.* is about $2 per gramme. *Imp.* free.

Iris. See ORRIS-ROOT.

Irish-Moss. See CARRAGEEN.

Irlanda [Sp.], fine Irish linen.

Iron [Fr. *fer;* Ger. *Eisen;* It. and Por. *ferro;* Sp. *hierro*]. *I.* and coal, it has been well said, are kings of the earth. No substance can indeed be named, possessing so many useful qualities, and capable of such a variety of applications, as *I.*, this most common of metals. It is of bluish-white color, and when polished has a great deal of brilliancy. It has a styptic taste, and emits a smell when rubbed. Its hardness exceeds that of most other metals; and it may be rendered harder than most bodies by being converted into steel. Its sp. gr. varies from 7.6 to 7.8. It is attracted by the magnet or loadstone, and is itself the substance which constitutes the loadstone. But when *I.* is perfectly pure, it retains the magnetic virtue for a very short time. It is malleable in every temperature, and its malleability increases in proportion as the temperature augments; but it cannot be hammered out nearly as thin as gold or silver, or even copper. Its ductility is, however, more perfect; for it may be drawn out into wire as fine at least as a human hair. Its tenacity is such that an *I.* wire 0.078 of an inch in diameter is capable of supporting 549.25 lbs. avoirdupois without breaking. To enumerate the various uses of *I.* would require a lengthened dissertation. No one who reflects for a moment on the subject can doubt that its discovery has been of the utmost importance to man; and has done more, perhaps, than anything else to accelerate his advance in the career of improvement. It is capable of being cast into moulds of any form, of being drawn into wire of any desired length or fineness, of being extended into plates or sheets, of being bent in every direction, of being sharpened, or hardened, or softened at pleasure. *I.* accommodates itself to all our wants and desires, and even to our caprices. It is equally serviceable to the arts, the sciences, to agriculture, and war. The same ore furnishes the sword, the ploughshare, the scythe, the pruning-hook, the needle, the graver, the spring of a watch or of a carriage, the chisel, the chain, the anchor, the compass, the cannon, and the bomb. *I.* is used in medicine as a reconstructive tonic. Among its numerous medicinal preparations in use are metallic *I.*, a grayish powder; protocarbonate of *I.*, in pills and mixtures; sulphate of *I.*; hydrated oxide of *I.*, also called subcarbonate; tincture of the chloride of *I.*; wine of *I.*; tartrate of *I.* and potassa; phosphate, lactate, and iodide of *I.*; citrate of *I.* and quinia; perchloride of *I.*; ferric alum, etc. There are many varieties of *I.*, distinguished in the arts by particular names, but all of them may be reduced under one or other of the three following classes: *cast* or *pig I.*, *wrought* or *soft I.*, and *steel*. *I.* is so widely diffused that almost every mineral contains some of it, and it is a chief constituent of a great many. It is not absent from the organic kingdom, and in the blood of all vertebrate animals occurs in notable proportions. It is not a little remarkable that while this commonest of metals is never found in the metallic state amongst terrestrial minerals, the aerolites, or meteoric stones, which fall upon our planet from out of the realms of immeasurable space, consist usually of little less than metallic *I.*, alloyed with a little nickel.

IRON ORES.

The minerals which yield *I.* are plentiful and easily obtained, but in them not a particle of *I.* exists in a metallic state, the metal being combined with oxygen and other bodies, so that

all the properties of the simple substance are entirely disguised. The richest and most valuable ores of *I* are oxides, such as the magnetic oxides, or magnetite, hematite, red hematite, specular *I.*, etc. Ores are rarely used which contain less than 25 per cent of *I.*, and they may be roughly divided according to their richness into *poor ores*, those between 25 and 35 per cent; *ordinary* or *average* ores, between 35 and 50 per cent; and *rich ores*, those containing more than 50 per cent of metallic *I.*

In the abundance, purity, and wide distribution of *I.* ores, and their accessibility to the largest coal areas in the world, the U. States possesses facilities for an iron industry unexcelled by those of any other land. Along the eastern coast the magnetic ores are found as an almost constant associate of the older metamorphic rocks, the gneiss, hornblende, and mica schists of the Appalachian Mountains, in nearly continuous lines of outcrop from the borders of the St. Lawrence River and Lake Champlain in N. New York, to their terminations in the N. part of Georgia. The ore occurs in beds interstratified with the other members of the Archæan system, following the severe contortions of that series, usually in lenticular-shaped deposits, and though limited in extent and thickness, are often of great magnitude. The thickness is subject to very great variations, and, while sometimes occurring in beds 150 to 200 feet thick, they are usually of much less size. In the character of the ores, the mode of occurrence, and their associations, they bear a very close resemblance to the magnetic deposits of Sweden. — In N. New York in the Adirondack Mountains, in Essex and Clinton Counties, immense beds are found, which have long been worked, and supply much of the ore consumed in E. New York and on the Hudson River. The great beds of the Moriah district in Essex County are remarkable for their great size, in some cases nearly 200 feet in thickness of solid ore. These ores often contain large proportions of titanic acid, sometimes from 12 to 30 per cent, which renders many deposits of little present value. Phosphorus and sulphur, especially the former, are quite generally present, and often in a damaging proportion. In the highlands of E New York, and portions of the adjoining State of Massachusetts, in the same belt of metamorphic rocks, valuable deposits of magnetite also occur, which are of special importance in Orange, Putnam, and Dutchess Counties. — In direct continuation of these deposits are those of the N. counties of New Jersey, Passaic, Sussex, Morris, and Warren, a belt of this same series passing across the State from N. E. to S. W, and contains some of the most valuable ores of the E. United States. In this region is also included the unique deposit of Franklinite, a manganiferous magnetite containing zinc, which is of great importance in the production of zinc and manganiferous pig-*I.* or spiegeleisen. The ores W. of the Hudson, in New York and N. New Jersey, have been wrought from a very early period, and contain but little or no titanium, but are commonly contaminated by sulphur or phosphorus, generally to so great an extent as to unfit them for the manufacture of steel-irons — In Pennsylvania the only really important deposits of magnetite are found in the S. E. part of the State, at Cornwall, in Lebanon County, where they occur near the junction of the Mesozoic sandstone and metamorphic Silurian slates. They are quite sulphurous, and are associated with copper minerals, but particularly free from phosphorus, and are altogether one of the finest and most important deposits in the country. In other places in E. Pennsylvania magnetites are found, and are remarkable often for an association with chrome and alumina. — Following this Archæan belt of the Appalachian Mountains, through Maryland and Western Virginia, magnetites occur in numerous places, but their importance is not yet fully known. — In W. North Carolina they have been fully investigated, and occur in an abundance and of a purity unsurpassed by any other of the well-known regions of the country. They are found in several nearly parallel belts, passing across the W. part of the State in a S W. direction into N. Georgia, where they still retain considerable importance. Some of the North Carolina ores are quite titaniferous, others aluminous or chromiferous, while others again are of very exceptional purity, as the celebrated Cranberry ore of Mitchell County. These ores are found often in beds of 300 or 400 feet in width, and are destined to assume a great value in the development of the *I.* industry of that region, especially as they are not far distant from the valuable extensions of the Alleghany coal-field in the Cumberland region of W. Tennessee, the Black Warrior basins, etc., of Alabama, and the Deep and Dan Rivers Triassic coal-fields of North Carolina. These magnetites of the E. United States flank the great Alleghany coal-basin along its entire E. margin, and must form the most important store-houses of ore for the *I* industry of that part of the country. — Bearing a similar though more remote relation to the N. W. margin of the Alleghany coal-basin and the coal-fields of the Mississippi Valley in Indiana, Illinois, Missouri, etc , are the rich specular hematites of Missouri and Lake Superior. The specular ores of Lake Superior, admixed in certain localities with magnetite, are found on the S. shore of Lake Superior beginning about ten miles from the lake in Marquette County, Michigan, and extending thence in a belt about 8 miles in width, in a south and westerly direction, into Northern Wisconsin. Developments, however, have only been made extensively in Marquette County, Michigan. The ore occurs in distinct beds in the metamorphic rocks of the Huronian age, which are chiefly quartzites, chloritic rocks, ferruginous schists, etc , in which the ore is often only a ferruginous stratum, rich enough to be valuable as an ore of *I.* These beds are of great magnitude, in some instances 200 feet or more in thickness, and not unfrequently occur in lenticular masses, as mentioned when referring to the magnetites of the E. United States. The ore varies from a very pure specular ore, often beautifully crystallized in lamellæ, to a silicious ferruginous rock, of little value as an ore; and on the whole the ores are generally silicious, and

Fig. 289. — Blast Furnace.

often contain much jasper. The ore is otherwise exceptionally pure. According to their richness, they are divided into three classes: 1st, containing 55 to 65 per cent of *I.*; 2d, those containing 45 to 55 per cent; and 3d, those ores below 45 per cent of *I.* The ore is mined almost entirely in large open quarries, and since the first openings in 1856 they have produced about one quarter of the pig-*I.* made in the entire U. States. The great deposits of specular ore in Missouri occur in isolated peaks, or islets, of the older Archæan rocks, probably of the same age as the very similar ores of Lake Superior, surrounded by the more recent sedimentary rocks. They are situated about 75 m. S.W. of St. Louis, and appear in two principal localities, removed from each other by only a few miles, — Pilot Knob and Iron Mountain. Adjoining Pilot Knob are Cedar Hill, Shephard Mountain, etc., which are also ore-bearing. In both these localities the characteristic associate of the ore is a porphyritic rock, which is usually very much decomposed. The Pilot Knob deposits form a regular bed, distinctly stratified, while the Iron Mountain ore is of a compact character, and is found in veins in the porphyry more or less irregular. The ores of both localities have much of the character and purity of the Lake Superior ores, though the Pilot Knob ores are much more silicious than the Iron Mountain. From the purity of the Lake Superior and Missouri hematites, they afford the main source of supply in the U. States for making *I.* for conversion into steel by the Bessemer process, and for this purpose they are very largely used. They are the main dependence of the *I.* industry in W. Pennsylvania, Ohio, and the Mississippi Valley, and in the coals of these regions the Lake Superior ores first meet an abundant supply of fuel, in which they are deficient at home. Magnetic ores have been found in the Archæan rock of Wyoming Territory, Arkansas, etc., but they have not yet become an element in the *I.* industry of the country. The next ore of importance in the U. States is the "fossil" ore, an oölitic red hematite, which is found as a member of the Clinton group in the lower Silurian formation, and is known in different sections as the *Clinton*, *fossil*, *dyestone*, and *flaxseed* ore. In the extent of its distribution, and the uniformity of its character and occurrence, it is one of the most remarkable ores in the country. Following the formation wherever it outcrops, it is found in almost a continuous stratum over a very large area of the Eastern U. States. In Dodge County, Wisconsin, it occurs as a bed 20 to 25 feet in thickness, of a soft gravelly character, and is there mined and known as flaxseed ore. Its next place of appearance is where the enclosing formation enters New York State at Little Sodus Bay, from which it passes E in a curved line through Oneida and Wayne Counties, and S. into Pennsylvania at Danville. It is mined and largely used in New York State, where it is familiarly known as the Clinton or Wayne County ore. From Danville, Pa., it passes S., through Huntingdon and Bedford Counties, and following the flanks of the Alleghanies it is found in all the intermediate States, disappearing finally in N. Alabama. At Danville and numerous other places in E. Pennsylvania and in Maryland it is very extensively worked, and known as the fossil ore. In E. Tennessee and in N. Alabama, as the dyestone ore, it forms a very important element in the *I.* industry of that region. The ore occurs as distinct strata in the Clinton group, usually in two beds, and though varying considerably, is on an average from 2 to 4 feet in thickness. The character of the ore is peculiar, being an aggregation of grains of peroxide of *I.*, each seeming to have a nucleus of some organic remains, and the mass is filled with fossils, and usually calcareous. It is probably the result of a deposition in shallow water in a manner similar to the accumulation of bog ore at the present day, and not a formation subsequent to that of the enclosing strata. Where, however, the beds have been highly tilted, the ore is not unfrequently found changed by the percolation of atmospheric waters into a brown hematite or hydrated oxide. The ore very generally contains considerable phosphoric acid from 0.5 to 1.00 per cent, and the pig-*I.* produced is wholly unfit for steel purposes and generally the better qualities of wrought-*I.*, yet it fulfils excellently well foundry purposes and the ordinary grades of malleable *I.* The ores of the coal measures of the U. States are much less abundant and important than those of Great Britain, and while valuable, are insignificant when compared with the richer and more commonly used ores already mentioned. In the Alleghany coal-fields no important deposits are found in the anthracite basins, and, though some local accumulations of argilliferous ores are found at the base of the upper group of coals, as the Oliphant ore, etc., of S. W. Pennsylvania and N. W. West Virginia, the chief deposits occur in the rocks of the lower group of coals. Several horizons in the lower coals in the western part of the Alleghany coal-field are peculiarly marked as ore-bearing, especially that of the *ferriferous limestones* of N. W. Pennsylvania and E. Ohio, and, while they are of some considerable value in N. W. Pennsylvania, they become of particular importance in the Hanging Rock region of S. Ohio, and E. Kentucky, where they are the foundation of a large industry. The ore resting upon a limestone is a carbonate of *I.*, more or less calcareous and argillaceous, though it appears more largely as a hydrated peroxide, the result of the decomposition of the original bed. Near the same horizon are also other deposits, of less interest, of nodular clay ironstone. In the Kanawha Valley of West Virginia important accumulations of ore are also found in the lower coal series, which are not yet, however, an essential element in the manufacture of iron in that region. At many horizons in the Alleghany coal-basin deposits of argillaceous shale occur including scattered kidneys or nodules of clay ironstone, but they are of very uncertain character and are rarely of any importance as ores. The coal-fields of the Mississippi Valley have nowhere been found to contain any considerable deposits of *I.* ore. Black band *I.* ores have been found in the Triassic coal-basin of North Carolina, but Dr. Genth reports them to be valueless as ores, from the large proportion of phosphorus present, derived from fossil organic remains. At Pottsville, Pa., black band occurs metamorphosed by the same action that changed the accompanying coal into anthracite, but the deposits have not been found to be of great extent. The only important deposit of black band known in the U. States is in the coal measures of E. Ohio, where it exists as a local accumulation at the top of the lower series of coals, in limited portions of Stark and Tuscarawas Counties. The deposit varies greatly in thickness and character, and, while ranging from 6 to as high as 16 feet, the average thickness is about 12 feet, though it not unfrequently thins out entirely, or passes into a nonferruginous bituminous clay shale. The ore is generally less rich than the Scotch black band, and contains 25 to 40 per cent of iron. — The only deposits of crystallized carbonate or spathic *I.* ore known in the U. States are found at Roxbury, Conn., and in S. Vermont, but they are of little economic significance. The brown hematites or limonites of the U. States are very widely distributed, and are of great interest in the *I.* industry of the country, and, while every State contains some deposit of them, they are particularly abundant in the valleys and lowlands along the flanks of the Alleghany Mountains, which are so rich in magnetic ores, and in similar relations, though in less extent, to the great ore deposits of Missouri and Lake Superior. These ores are largely used in the Eastern States as mixtures with the richer crystalline ores, and the deposits of S. Vermont, Salisbury, Conn., New York, and at other places, are well known, and contribute largely to the *I.* industry of that region. In E. Pennsylvania they are very abundant, and at numerous other places in the S. extension of the Alleghany Mountains, in Tennessee, etc., but, from the great uncertainty of the extent of the deposits, they rarely can prove the basis alone of any important *I.* industry in our country. — The Laurentian rocks of Canada are very rich in magnetic ores, similar in character to those of N. New York. The area including them stretches in direct continuation of the Adirondack region on the N. side of the St. Lawrence River in a N. W. direction, crossing the river about Ogdensburgh, and passing in a broad area along the E. shores of Georgian Bay and Lake Superior. The ore occurs in numerous deposits, similar in character to those of E. New York, and often of great dimensions, as the celebrated bed of Marmora, which is 100 feet in thickness. They have been mainly developed in the vicinity of the Rideau Canal, Marmora, Belmont, etc., in the region N. of Kingston, from which they have been shipped to some extent to the *I.* centres of Pennsylvania and Ohio. Though selected ore of a fair degree of purity is obtained, it is generally largely contaminated with sulphur and phosphorus, and often contains very large proportions of titanium. But while Canada contains very extensive deposits of ore, from the absence of mineral fuel it produces but a very small amount of *I.* The immense deposits of magnetite, specular, and other ores which are found in the U. States, and the facilities which our mode of transportation gives to their union with the great coal areas of the Alleghany and the Mississippi, must give to the U. States the foremost position in the future *I.* industry, and consequently of the manufactures of the world. In their development we are yet but beginning to realize their importance, and the future must witness great advances in the manufacture in the Eastern States, but more particularly in the Virginias, E. Tennessee, N. Alabama, and in W. North Carolina, which are so abundantly provided with rich and pure ores. The manufacture of *I.* in the Eastern States will undoubtedly be divided into two great regions, the northern centring in Pennsylvania, and the southern in adjoining corners of Alabama, Georgia, Tennessee, and North Carolina. Independent, however, of these regions in the E., the facilities offered by the valley of the Mississippi, in its valuable coal-basins, and the rich ores of Missouri and Lake Superior, must surely give materials to large *I.* industries, and all the attendant manufactures, and the rich and fertile valley of the Mississippi must be the home of a large, wealthy, and, from its position, a united population.

MANUFACTURE.

It is not definitely settled how far *I.* was used in ancient times, but it is certain that if it was known at all it must have been obtained directly from the oxides by the simple process of heating the ore with charcoal in a small furnace or on a hearth, the necessary temperature being obtained by urging the fire with some rude blowing apparatus. In localities where the nature of the ore is suitable and fuel abundant, malleable *I.* is still obtained from the ore by a single process, as in our old bloomary forges. But the largest amount by far of *I.* produced in all civilized countries is now obtained in the state of *cast-I.* by the process of *smelting*.

In this process the ore is roasted after having been broken up into lumps. The operation is performed by spreading alternate layers of coal and ore to a height of 10 ft., and then setting fire to the fuel at one end of the mass. The combustion spreads gradually through the heap, but some months elapse before it is completed. The effect of this is to drive off moisture and carbonic acid, and the ore is then ready for the *blast furnace* (see HOT-BLAST FURNACE). The interior of the furnace is lined with the very best fire-bricks, and the exterior is formed of a casing of solid masonry strengthened with iron hoops. Great care and expense are bestowed in the construction of these furnaces, and when the fire has been kindled it is never allowed to go out until the furnace needs repairs; so that such a furnace will continue in activity without intermission for a period of ten years, being regularly supplied at proper intervals with alternate charges of coal and a mixture of roasted ore with limestone in fragments. The limestone is added in order to render fusible the clay, and other earthy matter, which are associated with the carbonate of iron; these matters melt and form the glassy-looking slags that in a molten state are continually flowing over the tympstone. The air which issues from the tuyères is soon deprived of its oxygen by the excess of carbon, producing carbonic oxide, — and this gas, ascending, penetrates the heated ore, rendered porous by the previous roasting. Carbonic oxide is a combustible gas, and at the high temperature of the furnace it takes away oxygen from the *I.*, which then combines with a small proportion of the carbon in the coal, fuses, and, together with the melted slag, drops into the crucible of the furnace, where it sinks to the lowest part; while the slag floats on its surface, and flows over the tympstone as it accumulates, at the same time covering the surface of the melted *I.*, which otherwise would be oxidized by the blast, and would, in fact, burn by again uniting with oxygen.

The *I.* — which thus prepared always contains from 2 to 5 per cent of carbon — is drawn off at intervals of 12 or 24 hours by the removing with an *I.* rod the plug of clay stopping the tap-hole. The liquefied metal is allowed to run into a series of shallow channels formed in sand, where it solidifies, and when cold is broken into suitable lengths, and then presents itself in the form of the bars commonly known as *pig.-I.* This is the crude *cast-I.*; and here it will be desirable to refer to the fact that cast-*I.* is not simply *I.*, but a chemical compound of *I.* and carbon. As it runs from the smelting furnace, however, it contains many other substances, such as silicon, uncombined carbon, manganese and other metals, phosphorus, sulphur, etc. The properties of the metal are greatly modified by these bodies, even when present in very small proportions. In the variety of cast-*I.* known as *white I.* all the carbon is chemically combined with the metal, while in the *gray* and *mottled* varieties some of the carbon is separated from the *I.*, and is merely mechanically diffused throughout the mass in the form of small crystals, similar to those of graphite or plumbago. The following table shows the percentage composition of some samples of cast-*I*: —

	White.	White.	M'tl'd.	Gray.
Iron	88.81	89 304	93.29	90 376
Combined carbon	4.94	2 457	2.78	1.021
Graphite, or uncombined carbon	....	0.871	1.99	2.641
Silicon	0.75	1.124	0.71	3.061
Sulphur	trace	2.515	trace	1.139
Phosphorus	0.12	0 913	1.23	0.928
Manganese	5.38	2.815	trace	0.834

These examples will suffice to show that the composition of cast-*I.* varies greatly; and there are also wide differences in the mechanical properties of each variety. Gray-*I.*, that which is commonly produced from the furnace, is not so hard as the other kinds of cast-*I.*; it can be filed, or drilled, or turned in a lathe. The mottled variety is very tough, and on that account is preferred for casting guns. White cast-*I.* has, when broken across, a white lustre, and the fracture presents a lamellar crystalline texture. It is more fusible than the others, but it is very brittle, and so hard that it cannot be worked with steel tools. *I.* possesses a property which is by no means common to all the metals, — a property upon which chiefly depends its admirable suitability for receiving any required form by casting. At the moment that a mass of the fluid metal solidifies, its bulk increases, so that this metal is capable of receiving even delicate markings from the moulds in which it is cast. — No greater improvement was ever effected in any art by simple means than that introduced into *I.* smelting by the substitution of hot air for cold in the blast furnace. When a current of cold air is employed to urge on the combustion, it is evident that a portion of the heat produced is taken up in heating the nitrogen, which constitutes four fifths of the bulk of atmospheric air, and takes no part in the combustion. But when the air is heated to a high temperature before entering the furnace, no such cooling effect is produced, and consequently a much greater intensity of heat is obtained. The quantity of air blown into a blast furnace is enormous, its weight being greater than that of all the coke, ore, and limestone put together. It is calculated that the weight of the air passing through a smelting furnace amounts, in some cases, to between 2,000 and 3,000 tons in a week. It is not the total *quantity* of heat produced by the consumption of fuel throughout the whole mass of the materials in the smelting furnace that is effectual in the reduction of the oxide to the metallic state, or in the smelting of the slags and the *I.* A certain *temperature* must be obtained before any reduction or fusion takes place, and no amount of fuel burnt under conditions in which the requisite *intensity* of heat is not attained is of any avail in producing the required effect. Probably this important invention was rather a lucky hit than a result to which the inventor was led by the theory of the blast furnace as then understood; but the fact is undoubted that employment of hot-blast economizes fuel to an extent quite unexpected, and of which 50 per cent is perhaps not too high an estimate. For the production of the hot-blast, the air is made to pass through a series of pipes or chambers heated by a separate furnace, so that it may enter the smelting furnace at a temperature sufficiently high to melt a strip of lead held in a current of it, that is, about 620° F.

A mode of still further economizing fuel, introduced by Mr. Siemens, is by causing the hot gases which escape from the smelting furnace to pass through a chamber filled with fire-bricks, so arranged that the gases circulate freely round them; and when the bricks are by this means heated to redness, the current of gases is shut off from the chamber, and conducted through another precisely similar; while the blast of cold air is made to circulate through the heated chamber, and thus acquires a temperature of 1,200° or 1,300° F. Two of these chambers are used alternately, so that while one is employed in heating the blast, the other is acquiring from the furnace gases the heat necessary for it to perform the same duty. In this manner a great part of the heat of the waste gases is utilized.

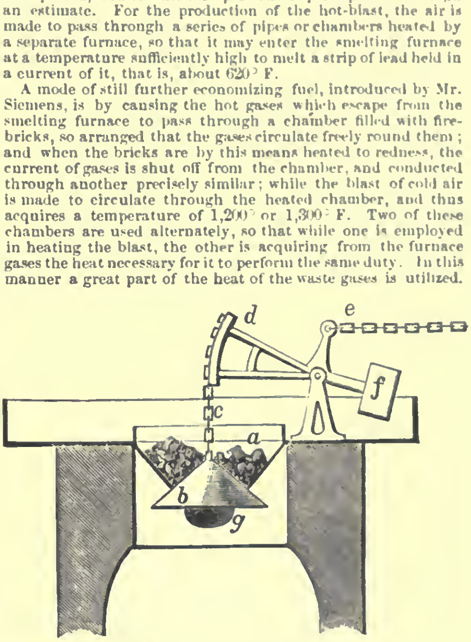

Fig. 290. — CUP AND CONE.

Other modes of employing the gases escaping from the chimneys of the smelting furnaces have also been adopted. — It will be remembered that the most active agent in the reduction of the metal is the carbonic oxide gas produced in the furnace by the incomplete combustion of the carbon of the coal. A large excess of this gas is produced, and escapes from the chimney of the furnace. The unconsumed carbonic oxide so escaping, together with the hydrogen and other combustible gases, forms more than a third of the gases issuing from the furnace. It is the combustion of these inflammable gases which produces the lambent flames often seen at the mouths of smelting furnaces, and imparting its most striking features to the night view of an *I.*-smelting region. Until recently, all the heat produced by these flames was absolutely wasted, but by various expedients a portion of the whole of these gases is now drawn off and allowed to burn in such a manner that the heat is available for raising steam or for heating the air-blast. It is obvious that if the gases are withdrawn from the furnace without checking the upward current, the processes could not suffer in any way. One very effective manner of doing this is shown in Fig. 290, which is a section through the upper part of a smelting furnace, with the "cup and cone" arrangement. The mouth of the furnace is covered with a shallow *I.* cone, *a*, open at the bottom, into which fits another cone, *b*, attached to a chain, *c*, sustained by an arm of the lever, *d*, which is firmly held in the required position by the chain, *e*, and is also provided with a counterpoise, *f*. In this position the mouth of the furnace is closed, and the gases find an exit by the opening, *g*, seen behind the cones, and leading into a passage through which the gases are conveyed to the place where they are required to be burnt. The charge for the furnace is filled into the hopper, *a*, and at the proper time the chain, *e*, is slackened, when the weight of the materials resting in the sus-

pended cone overcomes that of the counterpoise, and the charge slides down over the surface of the cone, *b*, which is immediately drawn up again by the counterpoise, so that the opening is at once closed.

Cast-I., it is well known, cannot be wrought with the hammer; it cannot be rolled into plates, nor welded on an anvil; it is not readily filed or worked with steel tools; and it possesses no ductility, and little tenacity, or power to resist a pulling force. On the other hand, *wrought-I.* possesses all these properties in the highest degree, but can be fused only by an extremely intense heat. In chemical composition the latter is essentially pure *I.*, whereas the former is essentially a compound of iron and carbon. Cast-*I.* is converted into wrought-*I.* by the processes of *refining* and *puddling*. The object of these operations is, as may be imagined, the removal of the carbon and other substances. The pig-*I.* is re-melted on the hearth of a furnace in such a manner that it is exposed to the action of the air for about two hours. The silicon, most of the carbon, and some of the *I.* itself are oxidized in this process. At one stage in the process the metal appears to boil, owing to the escape of jets of carbonic acid gas, formed by the union of oxygen and carbon in the midst of the mass. The oxidizing action is carried on through the whole, for the puddler stirs it up, so that every part is brought into contact with the oxygen, or with the oxide of *I.* formed on the surface, and carried by the stirring into the heart of the mass. With this object the *I.* is sometimes mixed with oxide of *I.* from the forge. As the *I.* loses its carbon it becomes less fusible, and at length the metal becomes a mass of loosely adhering grains, like so much damp sand. The heat is now raised, and the grains begin to fuse and become more adherent, so that the puddler is able to collect all the metal at the end of an *I.* rod into a spongy mass. He forms this into balls, or *blooms*, weighing about 70 lbs. each. The blooms consist of particles of nearly pure *I.*, partly fused together, but retaining in the interstices between them a portion of the fused slags, oxides, and other extraneous matters. They are now delivered to the *shingler*, by whom they are submitted, whilst still intensely hot, to the action of a steam hammer or other heavy hammer, or subjected to compression in a *shingling* press, or passed be-

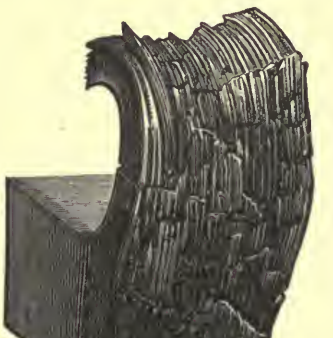

Fig. 291. — Fibrous Fracture of Wrought-Iron.

tween massive *I.* rollers. The design of this treatment is to compress the half-fused particles of *I.* into a compact mass, and to thoroughly squeeze out the slag and fused oxide. In any case the operation is concluded by passing the metal between grooved rollers, by which it is formed into bars. These are afterwards cut into lengths, reheated, and the rolling repeated, and so on several times, when the *I.* is required to possess great tenacity. The rolling of the blooms into bars is a striking spectacle. The furnace door is opened, the workman pulls out a white-hot ball, he throws it on the ground, whence it is instantly snatched up by an attendant Vulcan, armed with a pair of tongs, and applied to the largest-sized groove in a pair of massive rollers. The lump of *I* is shot through the rolls and is doubled in length by their pressure. No sooner has it come out than it is again seized and tossed back over the rollers, to be again passed through a smaller groove; and it thus passes backwards and forwards several times, increasing its length and improving in quality with each passage through the grooves. The whole operation is effected in an incredibly short time, and before the spectator has been able fully to comprehend the process the result is before him, — a long, straight, finished bar of glowing *I* is stretched on the sand; and scarcely has the bar been laid out to cool than another fiery mass is following the same course through the rolls.

Wrought-I. is never pure, but always contains a small proportion of carbon, varying from one fifth to one half per cent. The presence of this small quantity of carbon enhances rather than impairs its useful qualities; but some of the other ingredients of cast-*I.*, if not entirely removed in the refining and puddling processes, act most injuriously upon the qualities of the wrought-*I.* For example, the presence of a small proportion of phosphorus renders wrought-*I.* brittle and rotten when cold, although at a red heat it may be forged. *I.* having this defect is technically said to be *cold short*, while the term *red short* is applied to metal which when hot breaks and crumbles under the hammer, a condition occasioned by the presence of a small quantity of sulphur or of silicon. Wrought-*I.* is quite unlike cast-*I.* in texture, which we may compare to that of loaf-sugar; the former exhibits a fibrous grain, not unlike that of a piece of wood. This fibrous structure depends upon the mechanical treatment the *I.* has received, and in bars the fibres always arrange themselves parallel to the length of the bar. Fig. 291 shows the fibrous structure in a piece of *I.* when a portion has been wrenched off. Like wood, wrought-*I.* has much greater tenacity along the fibres than across them; that is, a much less force is required to tear the fibres asunder than to break them across. Consequently, to obtain the greatest advantage from the strength of wrought-*I.*, the metal must be so applied that the chief force may act upon it in the direction of the fibres.

Steel is a nearly pure compound of *I.* with carbon, the proportion of the latter element being much less than in cast-*I.*, and always less than one fiftieth. Good steel contains from 0.7 to 1.7 per cent of carbon, and some excellent qualities have been found to have from 1.3 to 1.5 per cent of carbon, together with 0.1 per cent of silicon. Steel is thus, as regards carbon, intermediate in composition between wrought and cast *I.*, and in a great measure possesses the most valuable properties of both. It may be wrought on the anvil at a white heat, and at a higher temperature it may be melted and cast in a mould. It is distinguished from cast-*I.* by its fine, close grain, and still more by its remarkable tenacity, in which property it excels wrought-*I.*; for, while a bar of the best wrought-*I.*, 1 in. sq., breaks with a load of thirty tons, a bar of good steel of the same size will sustain 75 tons, and, if the steel has been subjected to certain processes, its tenacity may even reach 120 tons. Still more remarkable is the wonderful property possessed by steel by which it may at will be made soft or hard, tough or elastic. If suddenly quenched in water when it is red hot, it acquires a hardness rivalling that of the diamond, and is also rendered very brittle and extremely elastic. The hardness and brittleness can be reduced by *tempering* to any required extent. Steel may be made either by stopping the processes by which carbon is removed from cast-iron at such a stage as to leave the requisite quantity of carbon in combination with the *I.*, or by reversing the decarbonizing process and recombining wrought-*I.* with carbon. In the latter plan, bars of the finest wrought-*I.* are heated for a week in a closed receptacle, tightly packed with powdered charcoal. But all the older plans for producing steel by the partial decarbonization of cast-*I.* have been eclipsed in interest and importance by Bessemer's discovery that the carbon and silicon may be readily removed by forcing currents of cold air through a mass of the fused metal. (See Steel.)

Spiegeleisen (literally *mirror-I.*), a white hard cast-*I.*, has had that name given to it by the Germans, from the fact that when it is broken across the fractured surfaces present numerous little mirror-like faces of crystals, having a pure silvery lustre. This *I.* is procured from ores which contain manganese, and it also retains a very large proportion of carbon. The composition of an average specimen of spiegeleisen may be stated as showing 4 to 4½ per cent of carbon, 10 per cent of manganese, and 1 per cent of silicon.

Production of Iron and Steel in the U. States.

The following table shows, in tons of 2,000 lbs., the production of all kinds of *I.* and steel in the U. States for the years 1876, 1877, and 1878: —

Products.	1876.	1877.	1878.
Pig-iron	2,093,236	2,314,585	2,577,861
All rolled iron, including nails and iron rails	1,509,269	1,476,759	1,555,576
All rolled iron, including nails and excluding rails	1,042,101	1,144.219	1,232.686
Bessemer steel rails	412,461	432,169	550.398
Open-hearth steel rails	....	....	9,397
Iron and all other rails	467,168	332,540	322,890
Rails of all kinds	879,629	764,709	882,685
Kegs of cut nails and spikes, included in all rolled iron	4,157.814	4,828,918	4,396.130
Crucible cast-steel	39,382	40,430	42,906
Open-hearth steel	21,490	25,031	36,126
All other steel, except Bessemer	10.306	11,924	8.556
Bessemer steel ingots	525,996	560,587	732,226
Blooms from ore and pig-iron	44,628	47,300	50,045
Spiegeleisen, included in pig-iron	6,616	8,845	10,674

Pig-I. The high price of *I.*, which prevailed during the rapid extension of our railroad network, made it profitable to work furnaces and forges whose locations and facilities would be very disadvantageous in times of ordinary demand. Since the demand for railroad *I.* considerably declined, the prices, owing to the excessive increase in the exceedingly expensive works necessary for *I.* production, and to the large accumulation of stocks to be disposed of, declined in a far greater ratio; so that no branch of industry has been in a worse financial position for some years past than the *I.* trade. The lowest production since the panic of 1873 was in 1876. The production has since steadily increased, but the prices obtained for pig-*I.* have not kept pace with the increase in production. The highest average monthly price at which best anthracite pig-*I.* has ever been sold in Philadelphia was in August, 1864, when \$73.62½ were paid; the lowest average monthly price at which sales of the same quality of pig-*I.* have been made was in November, 1878, when \$16.50 were accepted. Since that month prices have slightly advanced, till the beginning of 1880, when the scarcity of ore, keeping many furnaces out of blast, made prices bound upwards again, with such feverish fluctuations as to cause much uneasiness among *I.*-makers, their fear being that values were going to reach a point from which they would drop with a thud before long. It is, however, an established fact that the consumption of pig-*I.* in this country has greatly increased since 1876; and that this increase, if it is partly owing to rapid development of the Bessemer branch of our steel industry, is also partly due to an improvement in the business of the foundries and machine-shops of the country.

The number of furnaces in blast at the close of 1878 was 265; out of blast, 427. At the close of 1877 the number in blast was 270; out of blast, 446. As the production of pig-*I.* was 262,776 net tons greater in 1878 than in 1877, it is clear, from a comparison of the number of furnaces in blast in each of these years, that our furnace practice greatly improved in 1878. In this connection it is interesting to note the improvement in the management of our furnaces which has taken place since 1873. At the close of that year there were 410 furnaces in blast, and the production of the year was 2,868,278 net tons, or an average of 6,996 tons for each furnace; at the close of 1878 there were 265 furnaces in blast, and the production of the year was 2,577,361 tons, or an average of 9,726 tons for each furnace. These averages are, of course, only approximations to the actual results, the number of furnaces in blast in any one year varying with the months and possibly with the days of the year; but the basis of calculation is the same in each of the two years taken, and the averages obtained are therefore in a comparative sense correct. They indicate that the average production of the furnaces in blast in 1878 was almost 40 per cent greater than that of the furnaces in blast in 1873. The superior results obtained in 1878 were due in part to the use of a larger proportion of large furnaces; in part to greater skill in all the details of furnace management; and in part to the increased use of better ores and of Connellsville coke.

The following table shows in tons of 2,000 lbs. the production of pig *I.* in the U. States from 1854 to 1878, classified according to the fuel used: —

Years.	Anthracite.	Charcoal.	Bituminous	Total.
1854	339,435	342,298	54,485	736,218
1855	381,866	339,922	62,390	784,178
1856	443,113	370,470	69,554	883,137
1857	390,385	330,321	77,451	798,157
1858	361,430	285,313	58,351	705,094
1859	471,745	284,041	84,841	840,627
1860	519,211	278,331	122,228	919,770
1861	409,229	195,278	127,037	731,544
1862	470,315	186,660	130,687	787,662
1863	577,638	212,005	157,961	947,604
1864	684,018	241,853	210,125	1,135,996
1865	479,558	262,342	189,682	931,582
1866	749,367	332,580	268,396	1,350,343
1867	798,638	344,341	318,647	1,461,626
1868	893,000	370,000	340,000	1,603,000
1869	971,150	392,150	553,341	1,916,641
1870	930,000	365,000	570,000	1,865,000
1871	956,608	385,000	570,000	1,911,608
1872	1,369,812	500,587	984,159	2,854,558
1873	1,312,754	577,620	977,904	2,868,278
1874	1,202,144	576,557	910,712	2,689,413
1875	908,046	410,990	947,545	2,266,581
1876	794,578	308,649	990,009	2,093,236
1877	934,797	317,843	1,061,945	2,314,585
1878	1,092,870	293,399	1,191,092	2,577,361

Included in the aggregate pig *I.* production of the country in the past few years is the small quantity of spiegeleisen which has been produced. The number of net tons of spiegeleisen produced in 1878 was 10,674, against 8,845 tons in 1877, 6,616 tons in 1876, and 7,832 tons in 1875.

Iron and Steel Rails. The following table shows the production in net tons of rails of all kinds in the U States from 1871 to 1878, classified by States, together with the percentage made in each State in 1878: —

States in the order of their rail production in 1878.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	Percentage made in 1878.
Pennsylvania	335,604	449,113	328,522	259,288	255,136	353,925	347,968	406,266	46.026
Illinois	91,178	107,496	136,102	125,103	188,248	181,490	120,762	196,538	22.266
Ohio	75,782	138,165	130,326	82,561	91,775	100,799	82,270	87,520	9.915
New York	87,022	86,518	59,764	46,979	82,960	57,306	34,094	54,471	6.171
Wisconsin	28,774	37,284	39,495	29,680	28,403	21,280	21,439	28,900	3.274
Indiana	12,778	23,893	26,579	20,617	23,309	29,383	34,876	28,660	3.247
Kentucky	6,000	7,480	11,386	6,068	5,851	1,524	12,100	13,000	1.473
Kansas......................	......	......	......	2,000	5,000	14,707	16,018	12,685	1.437
Wyoming Territory	......	......	......	......	7,000	12,320	10,007	10,425	1.181
Tennessee	9,667	14,620	13,973	13,693	12,250	21,394	11,373	9,479	1.074
Georgia	7,840	6,930	8,275	8,061	6,500	9,000	10,031	8,345	.946
Massachusetts	28,864	29,242	34,034	24,765	18,391	9,061	9,640	7,965	.906
California	......	......	475	7,016	8,073	8,629	5,750	6,779	.768
Maryland....................	44,941	30,533	42,356	48,008	30,619	18,844	8,531	3,200	.363
Maine	13,383	14,058	16,500	14,650	4,050	7,500	2,526	3,022	.342
Vermont	......	......	6,088	10,400	6,204	9,183	3,899	2,200	.249
Colorado	......	......	......	......	......	......	......	1,600	.181
West Virginia...............	5,000	20,100	4,000	522	406	538	1,756	1,230	.139
Missouri....................	8,200	15,500	14,020	24,017	17,396	20,903	31,289	362	.041
New Jersey..................	6,700	9,185	13,749	3,537	941	243	380	8	.001
Michigan....................	14,000	9,883	4,433	2,448	......	1,600	......	......	......
Total....................	775,733	1,000,000	890,077	729,413	792,512	879,629	764,709	882,685	100.000

The production of *I.* and steel rails in this country, from the beginning of the manufacture of Bessemer steel rails down to 1878, was as follows:—

Years.	Iron Rails, all kinds. Net tons.	Bessemer Steel Rails. Net tons.	Total. Net tons.
1867..........	459,558	2,550	462,108
1868..........	499,489	7,225	506,714
1869..........	583,936	9,650	593,586
1870..........	586,000	34,000	620,000
1871..........	737,483	38,250	775,733
1872..........	905,930	94,070	1,000,000
1873..........	761,062	129,015	890,077
1874..........	584,469	144,944	729,413
1875..........	501,649	290,863	792,512
1876..........	467,168	412,461	879,629
1877..........	332,540	432,169	764,709
1878..........	332,287	550,398	882,685

The highest price ever obtained in this country for *I.* rails was in 1864, when it rose in September to \$153.75, the average for the year being \$126. In succeeding years the price steadily declined to \$32.50, reaching its lowest price in October, 1877; since which time prices have gradually advanced. The first importation of Bessemer steel rails into the U. States was in 1863, when a few tons were imported from England, and \$150 a ton was paid for them in gold. In 1867, when this country first began to make them to fill orders, the price of English steel rails fell in our markets to \$118 in gold. As a result of the domestic competition in the manufacture of steel rails which was established in that year, the price of these rails has since declined with great regularity, until in 1877 American Bessemer rails were sold as low as \$40 a ton, with an average for the year of \$45.50; while in 1878 the average fell to \$42.25. As both our imports and exports of rails of all kinds in 1878 were only nominal, it may be fairly assumed that the domestic consumption of rails in that year was equal to the production. The following table will show approximately the consumption of rails in this country from 1867 to 1878: —

Calendar Years.	Made in U. States. Net tons.	Imported Net tons.		Probable Consumption. Net tons.
1867..........	462,108		163,049	625 157
1868..........	506,714		250,081	756,795
1869..........	593,586		313 163	906,749
1870..........	620,000		399,153	1,019,153
1871..........	775,733	Iron, Steel,	515,000 50,701	1,341,434
1872..........	1,000,000	Iron, Steel,	381,064 149,786	1,530,850
1873..........	890,077	Iron, Steel,	99,201 159,571	1,148,849
1874..........	729,413	Iron, Steel,	7,796 100,515	837,724
1875..........	792,512	Iron, Steel,	1,942 16,316	810,770
1876..........	879,629	Iron, Steel,	287 None	879,916
1877..........	764,709	Iron, Steel,	None 35	764,744
1878..........	882,685	Iron, Steel,	None 10	882,695

Rolled Iron. The production of all kinds of rolled *I.* in the U. States in 1878, including *I.* rails, was 1,555,576 net tons, which was an increase of 78,817 tons over the production of 1877. Appended is a table which shows the production of *I.* rails and of all other forms of rolled iron since 1864. By the term rolled *I.* we include (1) *cut nails* and *spikes*; (2) *bar, angle, bolt, rod, skelp,* and *hoop I.*; (3) *plate* and *sheet I.*; and (4) all sizes of *I. rails.* Bessemer steel rails are not classed among rolled *I.* products.

Years.	Iron Rails. Net Tons.	Other rolled *I.* Net tons.	Total. Net tons.
1864..................	335,369	536.958	872,327
1865..................	356,292	500,048	856,340
1866..................	430,778	595.311	1,026,089
1867..................	459,558	579,838	1,039,396
1868..................	499,489	598,286	1,097,775
1869..................	583,936	642,420	1,226,356
1870..................	586,000	705,000	1,291,000
1871..................	737,483	710,000	1,447,483
1872..................	905,930	941,992	1,847,922
1873..................	761,062	1,076,368	1,837,430
1874..................	584,469	1,110,147	1,694,616
1875..................	501,649	1,097,867	1,599,516
1876..................	467,168	1,042,101	1,509,269
1877..................	332,540	1,144,219	1,476,759
1878..................	322,890	1,232,686	1,555,576

This table shows that the production of *I.* rails reached its maximum in 1872, and that it has annually declined since that year, the decline in 1878, as compared with 1877, being, however, only 9,650 tons. It further shows that the production of all other forms of rolled *I.* reached its maximum in 1878, when 88,467 more tons were produced than in 1877, and 156,318 more tons than in 1873, the year of the panic. The production of all rolled *I.*, exclusive of rails, more than doubled from 1868 to 1878. — The production of *bar, angle, bolt, rod, skelp,* and *hoop I.* in 1878 was 830,837 net tons, against 720,531 tons in 1877, 668,956 tons in 1876, 668,755 tons in 1875, 687,650 tons in 1874, and 705,964 tons in 1873. The production of *plate* and *sheet I.* in 1878, not including nail plate, was 182,042 net tons, against 182,242 tons in 1877, 165,255 tons in 1876, 192,769 tons in 1875, 176,888 tons in 1874, and 169,169 tons in 1873. The production of *cut nails* and *spikes* in 1878 was 4,396,130 kegs of 100 pounds each, against 4,828,918 kegs in 1877, 4,157,814 kegs in 1876, 4,726,881 kegs in 1875, 4,912,180 kegs in 1874, and 4 024,704 kegs in 1873. The tonnage of rolled *I.* converted into cut nails and spikes in 1878 and previous years was as follows: 1878, 219,807 net tons; 1877, 241,446 tons; 1876, 207,890 tons; 1875, 236,343 tons; 1874, 245,609 tons; 1873, 201,235 tons.

Steel of all kinds. The quantity of pig-*I.* spiegeleisen, and ferro-manganese converted into steel by the Bessemer process in the U. States in 1878 was 739,765 net tons, against 562,227 tons in 1877. Of spiegeleisen and ferro-manganese alone there were used 61,466 tons, against 48,229 tons in 1877, 45,980 tons in 1876, and 33,245 tons in 1875. The number of net tons of Bessemer steel ingots produced in 1878 was 732,226, against 560,587 tons in 1877. The number of net tons of Bessemer steel rails produced in 1878 was 550,398, against 432,169 tons in 1877. In addition to the rails produced, there were sold or worked up by the Bessemer works into other forms 73,370 net tons of ingots. There were ten Bessemer steel works in operation in 1878, the only remaining works, the Vulcan, at St. Louis, being idle. The works which were in operation used only 20 converters. Down to the close of 1878 this country had produced a total of 2,145,595 net tons of Bessemer steel rails. The following table shows in net tons the production of all kinds of steel in the U. States from 1872 to 1878: —

Kinds of Steel.	1872.	1873.	1874.	1875.	1876.	1877.	1878.
Bessemer steel ingots	120,108	170,652	191,933	375,517	525,996	560,587	732,226
Crucible cast steel	29,260	34,786	36,328	39,401	39,382	40,430	42,906
Open-hearth steel	3,000	3,500	7,000	9,050	21,490	25,031	36,126
All other steel	7,740	13,714	6,353	12,607	10,306	11,924	8,556
Total	160,108	222,652	241,614	436,575	597,174	637,972	819,814

It is one of the most interesting facts connected with the industrial development of our country, that the domestic Bessemer steel manufacture should have moved forward with giant strides during a period of such wide-spread and paralyzing depression as has prevailed in the U. States and in most other countries from 1873 to 1878. No example could better illustrate the abounding faith, the resolute courage, and the business sagacity of the American people, or more pointedly illustrate the real wealth of the country, both in material resources and pecuniary accumulations. Of the ten Bessemer steel establishments which made steel in 1878, one is in New York, five are in Pennsylvania, one is in Ohio, and three are in Illinois.

Blooms and Billets from ore are made mainly in the Champlain district of New York; blooms from pig and scrap *I.* are made mainly in Pennsylvania. The make of each product in the three years, 1873, 1877, and 1878, in net tons was as follows: —

Kind of Product.	1873.	1877.	1878.
Blooms and billets from ore	32,863	24,227	24.139
Blooms from pig and scrap iron...	29,701	23,073	25,906
Total.........................	62,564	47,300	50,045

Iron ore imported. The value of the *I.* ore imported into the U. States in the nine years from 1870 to 1878 is given in the following table. The number of tons imported in any one year may be approximately ascertained by dividing the value of the imports for that year by two, the invoice value of all the ore that has been imported being about two dollars a ton.

Fiscal Year.	New York.	Lake Ports.	Philadelphia.	Other Ports.	Total.
	$	$	$	$	$
1870	.....	34,439	.....	165	34,604
1871	153	66	.....	143	362
1872	2,116	49,607	.....	1,590	53,313
1873	29,152	92.856	.....	2.394	124,402
1874	21,544	105,167	.....	11,803	138,514
1875	16,253	74,425	55,896	85	146,659
1876	12,030	32 446	7,692	673	52,841
1877	25,466	18,627	34.388	4,466	82,947
1878	16,553	13 088	29,485	3,661	62,787

Imports of Iron and Steel, and manufactures thereof, into the U. States from all countries during the calendar year 1878.

Commodities.	Net tons.	Values.
		$
Pig-iron..........................	74,484	1,519,990
Castings..........................	69	7,170
Bar iron	33,346	1,515,598
Boiler iron	1	76
Band, hoop, and scroll iron........	7	453
Railroad bars or rails, of iron......	......	......
Railroad bars or rails, of steel......	10	435
Sheet iron..........................	838	92,586
Old and scrap iron	6,225	65,019
Anchors, cables, and chains........	646	66,964
Hardware	......	96 170
Machinery	......	555,174
Fire-arms	......	494,698
Steel ingots, bars, sheets, and wire..	......	1,135.784
Cutlery............................	......	1,126 904
Files	......	108.890
Saws and tools......................	......	7,306
Other manufactures not specified...	......	2,149,226
Total	115,626	8,943,043

Exports of Iron and Steel, and manufactures thereof, from the U. States to all countries during the calendar year 1878.

Commodities.	Quantities.	Values.
Iron, and Manufactures of:—		$
Pig-iron (net tons)	3.286	81,206
Bar iron " "	2,511	126,747
Boiler-plate iron (net tons)	189	10,695
Railroad bars or rails (net tons)	9,108	289,740
Sheet, band, and hoop " "	142	11,068
Castings, not specified	....	251,227
Car-wheels (number)	8,061	73,784
Stoves, and parts of	....	98,837
Steam-engines, locomotives (number)	82	785,716
Steam-engines, stationary "	94	127,076
Boilers, separate from engines	....	122,744
Machinery, not specified	....	3,616,915
Nails and spikes (net tons)	4,840	278,016
All other manufactures of iron	....	4,222,989
Steel, and Manufactures of:—		
Ingots, bars, sheets, and wire (net tons)	81	13,444
Cutlery	....	60,231
Edge-tools	....	827,798
Files and saws	....	38,271
Fire-arms	....	1,825.279
Railroad bars or rails (net tons)	249	9,839
All other manufactures of steel	....	388,747
Total exports of iron and steel	....	13,260,369
Agricultural Implements:—		
Fanning mills (number)	50	7,787
Horse-powers "	55	21,639
Mowers and reapers (number)	10,659	1,044,427
Ploughs and cultivators "	18,360	134,828
All others not specified	....	1,681,915
Scales and Balances	....	184,614
Sewing-machines	....	1,638,873
Fire-engines and Apparatus	....	18,043
Total Ag. Im., Fire-engines, etc.	....	4,732,126

Import duty: old scrap (cast, $6 per ton, wrought, $8 per ton). Moisie *I*, made of sand ore by one process, $15 per ton. Bars, rolled or hammered, including flats not less than 1 in. nor more than 6 in. wide, nor less than ⅜ in. nor more than 2 in. thick, and rounds not less than ¾ in. nor more than 2 in. in diameter, and squares not less than ¾ in. nor more than 2 in. square, 1 cent per lb. Bars, including flats less than ¾ in. and not above 2 in. thick, nor less than 1 in. or more than 6 in. wide, rounds less than ¾ in. nor more than 2 in. in diameter, and squares less than ¾ in. or more than 2 in. square, 1½ cents per lb. Other descriptions of rolled or hammered *I.*, n. o. p., 1¼ cents per lb. Bars, for railroads or inclined planes, made to pattern and fitted to be laid down, not above 6 in. high, 70 cents per 100 lbs. Band, hoop, slit, and rolled or hammered, and scroll, from ½ in. to 6 in. wide, not below ⅛ in. thick, 1¼ cents per lb.; from ½ in. to 6 in. wide, less than ⅛ in. thick, not less than No. 20 wire-gauge, 1½ cents per lb.; thinner than No 20 wire-gauge, 1¾ cents per lb. Boiler and other plate, n. o. p., $25 per ton; not less than $\frac{3}{16}$ in. thick, 1½ cents per lb. Rods, nail or spike, slit, rolled, or hammered, 1½ cents per lb. Sheet *I.*, smooth or polished, all, 8 cents per lb.; galvanized or coated with zinc, 2 cents per lb.; other sheet *I.*, common or black, not thinner than No. 20 wire-gauge, 1¼ cents per lb.; thinner than No. 20, not thinner than No. 25, 1½ cents per lb; thinner than No. 25, 1¾ cents per lb. Squares, marked on one side, 3 cents per lb, and 30 per cent; all other, of iron or steel, 6 cents per lb., and 30 per cent. Anchors, and parts thereof, 2¼ cents per lb. Andirons, cast, 1½ cents per lb. Anvils, 2½ cents per lb. Axles, or parts thereof, 2½ cents per lb. Blacksmiths' hammers or sledges, 2½ cents per lb. Bolts, wrought, 2½ cents per lb. Butts, cast, 2½ cents per lb. Castings, n. o. p., 30 per cent. Cables or chains, or parts thereof, 2½ cents per lb. Chains, trace, halter, or fence, of wire or rods, ½ in. in diameter or more, 2½ cents per lb.; under ½ in. in diameter, not less than ¼ in. in diameter, 2½ cents per lb.; under ¼ in. in diameter, not under No. 9 wire-gauge, 3 cents per lb.; under No. 9 wire-gauge, 35 per cent. Hatters' irons, 1½ cents per lb. Hinges, cast, 2½ cents per lb; wrought, 2½ cents per lb. Hollow-ware, glazed, tinned, 3½ cents per lb. Malleable, in castings, 2½ cents per lb. Mill-irons and cranks, 2 cents per lb. Nails and spikes, cut, 1½ cents per lb. Board nails, wrought (spikes and rivets), 2½ cents per lb. Nails, horseshoe, 5 cents per lb. Nuts and washers, wrought, ready punched, 2 cents per lb. Pipe, cast, for steam, gas, or water, 1½ cents per lb. Railroad-chairs, wrought, 2 cents per lb. Sad-irons, 1½ cents per lb. Screws, bed, 2½ cents per lb.; wood screws, over 2 in. in length, 8 cents per lb.; under 2 in. in length, 10 cents per lb.; washed or plated, and all other, 35 per cent. Stoves, and stove-plates, of cast iron, 1¼ cents per lb. Tailors' irons, 1½ cents per lb. Tacks, sprigs, brads, cut, not exceeding 16 ounces per mille, 2½ cents per mille; exceeding 16 ounces per mille, 3 cents per lb. Taggers' iron, 30 per cent. Tire for locomotives, 3 cents per lb. Tubes, flues, etc., for steam, gas, and water, wrought, 3½ cents per lb. Vessels, cast iron, n. o. p., 1½ cents per lb. Wire, bright, coppered, or tinned, drawn and finished, not above ¼ in. in diameter, nor thinner than No. 16 wire-gauge, 2 cents per lb., and 15 per cent; thinner than No 16, not thinner than No. 25, 3½ cents per lb, and 15 per cent, beyond No. 25, 4 cents per lb., and 15 per cent; covered, cotton, silk, etc. (additional), 5 cents per lb. *Provided*, That all wire-rope and wire-strand, or chain made of iron wire, either bright, coppered, galvanized, or coated with other metals, shall pay the same rate of duty that is now levied on the iron-wire of which said rope. or strand, or chain, is made; and all wire-rope and wire-strand or chain, made of steel-wire, either bright, coppered, galvanized, or coated with other metals, shall pay the same rate of duty that is now levied on the steel-wire of which said rope, or strand, or chain is made. Wrought-*I.* for ships, locomotives, or parts thereof, weighing 25 pounds or more, 2 cents per lb. All manufactures of, n. o. p., 35 per cent. Liquor, 10 per cent. Sulphate of *I.*, ½ cent per lb.

INDEX.

Iron-clad Vessel. So long as the guns employed in naval warfare were limited to 68-pounders as a maximum, strongly built timber ships were considered sufficient for the necessities of the case; but when ordnance hurling shot and shell of 100 lbs., 200 lbs., or even 300 lbs. weight came into use, the bulwarks were no longer adequate. Hence the invention of iron-clads, or armor-plated ships. The first actually built were some floating batteries used by the French during the Crimean War in 1854; they were not only built of iron, but were coated with thick iron slabs. The English government, following the example, built eight floating batteries in 1856,—very slow and unmanageable ships. The civil war of 1861 gave great impetus to improvements in iron-clad vessels, and numerous modifications of plan have been adopted, to ascertain which among them possesses a preponderance of practical advantages. Large timber-built men-of-war, whether finished or not, have been cut down in height, increased in length, and clad with 4½-inch armor plates, backed by 30 inches of solid timber. Some of the timber ships, thus altered, lengthened, and armed, have been provided with solid projecting rams of great weight and power, to pierce an enemy's side. Some, to render the ship more buoyant, have had the armor plates only over the most exposed parts; while others have been clad from stem to stern. Some have had the guns placed in a revolving turret of immense strength, instead of as a broadside in the usual way. (See MONITORS and TURRET SHIPS.) A plan has been tried in a few cases of notching or bevelling the sides of the ship in such a way that the guns may be trained to take a very wide sweep, so as to fire, if needed, much nearer in a line with

the keel than is usually practicable. After many partially built timber ships were converted into iron-clads, others built wholly of iron were commenced; and these form the most formidable class of the two. To ascertain the effect of actual size, the English Admiralty have built the vast ships *Northumberland*, *Agincourt*, and *Minotaur*, each about 400 feet long and 7,000 tons burden, with 5½-inch armor plates. To ascertain the capabilities of the armor without immediate reference to the size of the ship, plates have been used 6, 7, 8, and even 9 inches in thickness. Various modes of arranging the armament have been adopted, as a means of determining whether it will be better to have a moderate number of guns throwing 100-lb. to 200-lb. shot and shell, or a few of those monster guns which will hurl from 300 lbs. to 600 lbs. of metal against the enemy. A terrible naval war will alone settle these and many other disputed questions.

Iron-Foundry, a place where iron castings are made.

Iron-Heater, the piece of metal which is heated in the fire for a laundress's box-iron or Italian iron.

Iron-Holder, a stand for a laundress's smoothing-iron.

Ironing-Blanket, a coarse blanket used as a smooth surface by laundresses when ironing linen.

Ironing-Board, a tailor's board on which cloth is pressed with an iron to smooth the seams, etc.; a laundress's board, covered with flannel, for ironing ladies' dresses; a table.

Ironing-Machine, a machine of which there are several forms, adapted for ironing clothes, hat-ironing, hosiery, for tailors, etc.

Iron-Liquor, a solution of acetate of iron used as a mordant by calico printers. It is usually called printers' liquor.

Iron-Master, a manufacturer of raw and bar iron; the owner of smelting works, or blast furnaces, for making iron from the ore.

Iron-Merchant, a wholesale dealer in iron.

Ironmongery, the English term for hardware.

Iron-Mould, a mark on linen made by the rust of iron.

Iron-Paper. See SHEET-IRON.

Irons, tools for heating at a fire, as laundresses' flat and box smoothing-irons for clothes; tailors' and hatters' irons, etc. — The poker, tongs, and shovel, for a grate. — Shackles or manacles for the legs.

Iron-Scraps, the cuttings and parings of iron-work which are saved, collected together, and melted again in the puddling furnace.

Ironsmith, a worker in iron.

Iron Spoon, a kitchen spoon used by cooks.

Iron-Stone, the argillaceous carbonate of iron, commonly known as clay iron-stone. See PORCELAIN.

Iron Vessel. See SHIP-BUILDING.

Iron Wire. See WIRE.

Iron-Wood [Fr. *bois de fer ;* Ger. *Eisenholz ;* It. *legno di ferro;* Sp. *plo hierro*], a common name for many trees, producing hard, ponderous, close-grained woods; in America, for the *Ostrya Virginica*, a tree which only grows to a small size, but the white wood is compact, finely grained, and heavy. There is an iron-wood in Brazil, but the tree yielding it is not defined. Another iron-wood entering into commerce is the *Metrosideros verus*, brought from China. The *Argania sideroxylon*, of Morocco, is another close, hard wood which sinks in water.

Iron-Work, anything made of iron; the parts or pieces of a building or machine which consists of iron.

Irrigation, the practice of flooding land in arid countries.

Irving Insurance Co., a fire-insurance Co., located in New York city, organized in 1872. *Statement*, Jan. 1, 1879: Cap. stock paid up in cash, $200,000; net surplus, $32,117.92; risks in force, $7,112,418; premiums, $66,507.21; premiums received since the organization of the Co., $646,008,-.84; losses paid, $372,308.79; cash dividends paid to stockholders, $120,000.

Isinglass, Fish-Glue [Fr. *colle de poisson ;* Ger. *Hausenblase ;* It. *cola di pesce ;* Russ. *klei rübüi, karluk*], one of the purest and finest of the animal glues, is a variety of gelatine, prepared from the air-bag, swimming-bladder, or sound of various fishes. The Russian and Siberian *I.* is most esteemed; it is chiefly obtained from sturgeons. The swimming-bladder is cut up, washed, and then exposed to the air, with the inner silvery membrane upward. When dry, this membrane is removed by beating and rubbing; the sound is then prepared in various ways. For forming what is called *leaf I.*, it is merely dried; for *long* and *short staple*, it is twisted between three pegs, into the shape of a horseshoe, harp, or lyre; for *book* isinglass, it is folded like the sheets of a book; for *ribbon I.*, it is rolled out. The swimming-bladder of *Acipenser sturio* of the Caspian Sea furnishes leaf isinglass of three qualities, known as *fine-firsts*, *firsts*, and *seconds*. A sturgeon of the Caspian and Black Seas and their tributary rivers yields staple and leaf *I.* The varieties of staple are *Patriarch Astrakhan*, and *Astrakhan firsts, seconds*, and *thirds*. The varieties of leaf are also *firsts, seconds*, and *thirds*, — the firsts forming the finest leaf known in commerce. There is also the *sisane leaf*, said to be obtained from a small fish, and *kroski I.*, which is made into small membranous disks. *I.* is also procured from *Siluris glanis*. For *purse, pipe*, and *lump I.* the swimming-bladder is dried unopened, and the variety known as *Siberian purse*, of moderately good quality, is greatly in demand. Brazilian *I.* is obtained from Para and Maranham, but the fishes which produce it have not been named. For the variety known as *pipe-Brazil*, the swimming-bladders are dried unopened, and made into pipes 10 or 12 inches long, and from 2 to 2½ inches broad, and are sometimes distended with air. *Lump I.* is formed by placing two swimming-bladders side by side, and for *honeycomb I.* the largest lump *I.* is split open. The New York and New England *I.* is obtained from the sounds of the codfish and of the common hake. The *patent gelatine* prepared from glue pieces or cuttings of hides, etc., after the manner of glue, is also used as a substitute for *I.* A solid gelatine in thin plates and strings is prepared from bones, and is chiefly of French manufacture. Japanese *I.* is a substance prepared from sea-weeds.

I. is prepared for sale by being picked and cut. This was formerly done by hand, but is now effected by steam machinery; the thin filaments thus produced should be whitish in color, dry, semi-transparent, nearly tasteless, and quite devoid of smell. Isinglass differs from glue in being tough, fibrous, and elastic, instead of brittle. On boiling. it should completely dissolve, and on cooling, should form a white jelly, soluble in weak acids, but separable from them by alkalies. With milk and sugar it is used as a diet for invalids, and it is also used in the preparation of blanc-mange, jellies, and creams, and for enriching soups and sauces. *I.* is no longer considered to be highly nutritive; it is even less digestible than the flesh or muscular part of animals. The great consumer of *I.* is the brewer, who uses it as a fining material, for which purpose lump *I.* is chiefly used. This is deeper in color, and inferior in solubility, to the better varieties. On mixing it with the liquor to be fined, it partly combines with some of those mat-

ters which render the liquor cloudy, and entangles in its meshes those which are mechanically suspended; the whole then rising to the surface can be removed, and the liquor be left clear. Wine, coffee, and other liquids are also clarified by *I.*, but sole-skins and hartshorn shavings are often used as substitutes for it. *I.* forms the adhesive material in court-plaster, for which purpose a solution of *I.*, mixed with tincture of benzoin, is brushed over black sarsanet. *I.* dissolved in spirits of wine or common gin, and gently simmered by placing the bottle in a vessel of boiling water for about an hour, forms *diamond cement*, or *white fish-glue*; gum ammoniac is sometimes added. Panes of *I.*, instead of glue, have been used instead of horn, for lanterns, and also for lamp-shades, etc.; also for window lights of vessels, being covered with a transparent varnish which is not affected by moist air. Hence, sheets of mica prepared for similar uses, as in the doors of stoves, are often called *I.*

The value of imports of *I.* into the U. States for the year 1870 was $38,300. *Imp.* free.

Ispruk, a coarse powder made from a species of delphinium growing in Afghanistan, used in dyeing.

Istle Grass. See TAMPICO FIBRE.

Italian Cloth, Farmer's Satin, Satin de Chesne, a light material of cotton and worsted, used for coat-linings.

Italian Iron, a laundress's heater for fluting and smoothing frills, etc.

Italian Juice, the extract of licorice prepared in Calabria; that sold under the name of solazzi juice is, when genuine, most esteemed.

Italian Wines. Some of the best wines in Italy are found in the vicinity of Naples. The soil there being volcanic is eminently adapted for the vine. In Calabria, though some places are too warm for vineyards, others are exceedingly well adapted to every species of vine. The principal Neapolitan wine is the *Lacryma Christi*, a sweet or rather luscious wine, which holds a place in the foremost rank of the first class produced by any country. Very little of the genuine wine is made even in the most favorable years. It is an exceedingly rich variety, of a red color and exquisite flavor. *Vino Greco* is a sweet wine from a grape of that name. A white muscadine wine, of fine color, delicate, and rich in perfume, is also made near Vesuvius. The grape of the Vino Greco is said to have been brought from Greece. A good deal of Lacryma Christi, of an inferior quality, grown in various places around Vesuvius, as at Torre del Greco and Novella, is exported as the genuine wine. The best is grown at Galitta. At Baia and Tarento both muscadine and dry wines are made of good quality. The Lacryma Christi of Naples is said by some to be the *Falernian Wine* of Horace, as if anything like precision could be attained from the poet's description of the luxury in his existing works. The wines in the Roman provinces are generally common, but several of them are good. The better kinds, most probably from negligence in the manufacture, will not keep; though in the country they are thought excellent. The most delicate wine is produced at San Maimo, called *Muscatta*. Imola, near Bologna, is remarkable for its boiled wines. These in their natural state are effervescent, like Champagne. On the shores of the Lake of Garda they make a sweet wine of prime quality, called *Vino Santo*. It is not extracted from the grapes until Christmas, and is drank at the following midsummer. Tuscany is considered the country of the vine in Italy, and it is treated there much better than in other parts of the country. The celebrated *Verdea* is a white wine, having a bright green tinge, grown at Arcetri; it was formerly held in high esteem. The red wine of Chianti, the wines of Val di Marina, Carmignano, Poncino, Antella, Artiminio, and others of the same class, are produced not far from Florence, and are several of them excellent. The wines of Sienna, among them Montelcino, Rimaneze, and Santo Stefano, are good, luscious wines. The *Aleatico* of Tuscany resembles "tinto," and is a red muscadine wine, made near or at Monte Pulciano. It is a wine of great excellence, with a rich perfume. The *Malvagia* wine of Trebbio is a very fine variety. The red Florence wine, as it is called, is deeper in color than claret, and harsher, being left long on the murk. Piedmont produces red wines of tolerable quality. An effervescing wine is made at Lasseraz from the malvasia grape. Asti, near Marengo, and Biella produce red wines of good flavor. Sicily produces wine in great abundance. The best wines of the province of Mascoli grow on Ætna, and are red, being almost the only good red wine of the class in the island, though others are produced at Taormina and Faro, but they have a taint of pitch. Syracuse produces over its mouldering remains a red muscadine, equal to any other in the world, if not superior. Messina furnishes much wine for exportation. The *Val di Mazara*, and the *Marsala*, when obtained without the admixture of execrable Sicilian brandy, are an agreeable wine, something like Madeira of the second class, and of great body. Augusta produces wine having a strong flavor of violets. — Wine in *I.* was formerly made almost exclusively for home consumption, and, notwithstanding the excellence of the grape and the congeniality of the climate, the general neglect of a careful and just system of culture prevented the capabilities of the Italian vineyards from being known. Of late, however, the attention of agriculturists has been turned to the cultivation of the grape, and large quantities of wine are now exported from every part of the kingdom.

Italic, a kind of inclined type used by printers; that in which the scientific and foreign names are given in this work.

Italy, a Kingdom in the South of Europe, consisting of a peninsula and the large islands of Sicily, and Sardinia. It is situated between lat. 36° 40′ and 46° 40′ N., and lon. 6° 30′ and 18° 30′ E. Previous to 1859 Italy was divided into the kingdoms of Sardinia and the Two Sicilies (Naples and Sicily), the Pontifical States, the Lombardo-Venetian province of the Austrian Empire, the Grand Duchy of Tuscany, and the Duchies of Parma and Modena. In 1859 Victor Emmanuel, king of Sardinia, obtained Lombardy, Parma, Modena, and part of the Pontifical States; Tuscany was annexed 22d March, and the Marches, Umbria, and the Two Sicilies 17th Dec., 1860, and in 1861 these were all united under the title of Kingdom of Italy, with the seat of government at Florence. By the treaty of Prague, 23d August, 1866, Venetia was added, and finally the remainder of the Papal States were annexed by royal decree 9th October, 1870, and Rome again became the capital of a united Italy. The government is a constitutional hereditary monarchy. The executive power of the State belongs exclusively to the sovereign, and is exercised by him through responsible ministers; while the legislative authority rests conjointly in the King and Congress, the latter consisting of two Chambers,—an upper one, the Senate, and a lower one, called the Camera de' Deputati. The Senate is composed of the princes of the royal house who are of age, and of an unlimited number of members, above 40 years old, who are nominated by the king for life. The number of senators, in the session of 1878, was 270. The deputies of the lower house are elected

by a majority of all citizens who are 25 years of age, and pay taxes to the amount of 40 lires, or $8. For this purpose the whole of the population is divided into electoral colleges, or districts. Neither senators nor deputies receive any salary or other indemnity. The Camera de' Deputati, in the session of 1878, numbered 508 members, being the prescribed rate of one deputy to 40,000 souls. Each of the Chambers has the right of introducing new bills; but all money bills must originate in the House of Deputies. For administrative purposes, the kingdom is divided into 69 provinces, which are again subdivided into districts and communes. In each province the executive power of the government is intrusted to a prefect appointed by the ministry. The following table gives the area and population of the larger territorial divisions, called *compartimenti*, which, for the most part, correspond to the old divisions of *I.*: —

Territorial Divisions.	Square miles.	Inhabitants (Census 1871).		Inhab'nts in 1877 (official return).
		Male.	Female.	
Piedmont	11,306	1,450,357	1,449,207	3,027,596
Liguria	2,056	419,919	423,893	874,616
Lombardy	9.085	1,755,545	1,705,279	3,589,527
Venetia	9,060	1,334,364	1.308,443	2,769,594
Emilia............	7,921	1,078,686	1,035,142	2,174,579
Umbria...........	3,720	282,574	267,027	567,131
The Marches......	3,746	449,548	465,871	936,135
Tuscany	9,287	1,096,652	1,045,873	2,192,292
Rome	4,601	449,346	387,358	841,140
The Abruzzo and Molise	6,677	625,547	657,435	1,315,197
Campania.........	6,942	1,366.557	1,388,035	2,834.982
Apulia	8.539	708,514	712,378	1,488,218
Basilicata.........	4,122	248,220	261,323	522,772
Calabria	6,663	593,829	612,473	1,240,772
Sicily	11,291	1,284,531	1,299,568	2,736,545
Sardinia	3,399	327,073	309,587	658,479
Total	114,415	13,472,262	13,328,892	27,769,475

The great mass of the people of *I.* are devoted to agricultural pursuits, and the town population is comparatively small. The number of inhabitants of the principal towns was as follows in 1877: —

Towns.	Population.	Towns.	Population.
Naples	461.627	Genoa	130,269
Milan	275,516	Venice.........	128,901
Rome..........	266,738	Bologna........	115,957
Palermo	219,938	Messina	111,854
Turin	240.868	Leghorn	97,096
Florence	167,093	Catania	84,397

The number of emigrants from *I.*, very small previous to the establishment of the kingdom, has much increased in recent years, reaching 117,612 in 1878. The emigration is partly European, directed to France, Austria, and Switzerland, and also to South American states. In 1879 the emigration to the U. States began to assume important proportions.

Surface and Climate. The face of the country is much diversified by mountains. The Alps form its N. and N. W. boundary, and the Apennines, running through its whole length, determine its configuration and its physical character. The coast line of *I.* proper (see SARDINIA and SICILY) is upward of 2,000 m. From Genoa to the frontier of France the coast, called Riviera di Ponente (shore of the setting sun) is lofty and precipitous. From Genoa to Spezia is the Riviera di Levante (shore of the rising sun), which is also bold and mountainous, but less precipitous. The coasts of Tuscany and Rome, from the mouth of the Arno to Baia, are generally low and marshy. The Neapolitan coast along the Tyrrhenian and Ionian Seas, up to Cape Rizzuto, is generally bold and rocky. Beyond Taranto, as far as Ancona, the shore is flat and sandy, being only broken by the spur on which stand Mts. Gargano and Sant' Angelo. Thence, northward to Rimini, the coast rises gradually, to subside rapidly beyond that city into a series of sandy islands, lagoons, and pestilential marshes, extending almost to the mouth of the Isenzo. All the rivers of *I.* are subject to sudden and very heavy floods, and, with the exception of the Po, the Adige, and the Tiber, have their volume of water greatly reduced in summer. The insignificant amount of tide in the Mediterranean renders most of them useless for navigation. In a country extending through 10 degrees of latitude there must be great difference of climate, and consequently of vegetation and agriculture, from position alone. Besides that, however, the climate of *I.* is greatly modified by the ranges of the Alps and Apennines, and by the air of the sea along its coast. In the plains of Piedmont and Lombardy, which are enclosed by mountains on every side but the E., the thermometer in winter descends to 10° F. Delicate plants do not thrive, except in sheltered situations, but the mulberry-trees flourish, rice is grown, and the pastures are rich. South of the Apennines, that part of Tuscany and former States of the Church which is near their main range is subject to great cold; but westward, and along the Riviera, the temperature grows milder, snow seldom lies long on the fields, and the climate is suitable to the growth of the olive and the orange. But it is when we reach the central range of the Apennines that we find the coldest districts of *I.* In all the upland valleys of the Abruzzi and of Saunio, snow begins to fall early in November, and heavy storms occur often as late as May. The district extending from the S. E. of Lake Fiscinus to the Piano di Cinquensiglia, and enclosing the upper basin of the Sangro and the small lake of Scanno, is the coldest and the most bleak part of *I.* south of the Alps. Yet, less than 40 m. E. of this district we find the olive, the fig-tree, and the orange thriving luxuriantly on the shores of the Adriatic from Ortano to Vasto. In the same way, while in the plains and hills round Naples snow is rarely seen, and never remains long, and the thermometer seldom descends to the freezing-point, 20 m. E. from it, in the fertile valley of Avellino, of no great elevation, but encircled by high mountains, light frosts are not uncommon as late as June. But nowhere are these contrasts so striking as in Calabria. The shores, especially on the Tyrrhenian Sea, present almost a continued grove of olive, orange, lemon, and citron trees, which attain a size unknown in the North of Italy. The sugar-cane flourishes, the cotton-plant ripens to perfection, the date-trees are seen in the gardens, the rocks are clothed with the prickly pear or Indian fig, the enclosures of the fields are formed by aloes and sometimes pomegranates, the licorice-root grows wild, and the mastich, the rosemary, the myrtle, and many varieties of oleander and cistus form the underwood of the natural forests of arbutus and evergreen oak. If we turn inland but five or six miles from the shore, and often even less, the scene changes. High districts covered with oaks and chestnuts succeed to this almost tropical vegetation; a little higher up, and we reach the elevated table-lands of the Pollino and the Sila, covered with firs and pines, and affording rich pastures even in the midst of summer, when heavy dews and light frosts succeed each other in July and August, and snow begins to appear at the end of September or early in October.

Agricultural Products. The cerealia form, as elsewhere in Europe, the chief aliment of the inhabitants; in Italy, however, the lower classes, who are the most numerous, subsist much on maize and beans, which require little preparation to render them fit for food. In some of the southern parts wheat is made use of by the same class, both in the form of bread and in that of macaroni, which is manipulated with great facility. Wheat and maize are, on the average of years, about equal to the consumption, but little can be spared for exportation; and in many of the ports are depots of foreign wheat kept to meet the variations of seasons, or to be used as articles of commerce with other countries. Barley, oats, and rice are not extensively cultivated, but abundance of beans of various kinds are produced. Rice grows in many parts, in fact wherever there is a sufficiency of water to insure a good produce, at such distance from towns as not to be injurious to the health of the inhabitants. It is a part of almost every meal in families in easy circumstances, but is scarcely used by families who are in circumstances that require the practice of great parsimony. A great variety of lupines are used as food, especially in the soups. In some parts of the mountainous regions chestnuts are a substitute for corn as long as they last. Fruits are plentifully used, particularly figs, grapes, and melons, as food, while the cheapness of onions, garlic, tomatoes, and capsicums, render them valuable as condiments. The potato has been but partially introduced into Italy; and, where it is cultivated, it occupies a very small proportion of the soil. Lettuces, asparagus, endive, artichokes, and several kinds of turnips and of carrots are everywhere grown. Animal food is far from being extensively used. The oxen yield in some parts excellent, in other very indifferent, meat. The mutton is neither good nor abundant, but has been much improved of late years. Swine furnish a plentiful supply during the winter months; they are also prepared as bacon or hams, and above all as sausages, the

fame of which latter has reached unto this country under the name of the city of Bologna, where they were early and extensively prepared. The large dairy farms in Lombardy, in which the cheese known by the name of Parmesan is made, and the oak and chestnut forests of Calabria, furnish the most and best swine's flesh. The sugar-cane is not cultivated in the South of Italy, as it is found that in point of strength, as well as of cost, the sugar made from it does not succeed in a competition with that substance when imported from the West Indies. The products of agriculture are sufficient for the clothing of all the inhabitants; for though wool is neither good nor plentiful, yet hemp and flax are grown everywhere, are manufactured at home, and, from the nature of the climate, linen can be substituted for woollen dress during most of the months of the year. Some raw wool is, however, imported to supply the manufactures, and some cloths, from England, France, and Bohemia. Cotton is grown extensively in the S. districts of *I.*, but not sufficient to furnish materials for their manufactures of that article. The chief product of Italian agriculture is the silk. It is produced from every part, and much of it is converted into articles of dress or of furniture where it is collected; but the chief production of it is in Sardinia, Naples, and Lombardy. The value of this commodity exceeds that of all the other productions of *I.* which are exported to foreign countries. The silk manufactures of *I.* are the most important in Europe, and are one of the great sources of national wealth: the number of spindles employed in silk spinning is about 3,000,000. Another very important Italian product, which is used partly as food, partly employed in home manufactures, and extensively exported as an article of foreign commerce, is the oil of the olive-tree. It is used as a substitute for butter in the S., is much appropriated to the manufacture of many kinds of soap, and is largely exported. The planting and watching cost but little labor or expense, and in a few years the income more than recompenses the labor. The best olive-oil is produced near Genoa, in Lucca, in Tuscany, and in Calabria; but it is plentiful throughout the whole of *I.*, except in Lombardy and in Piedmont.

Minerals. Piedmont is especially rich in metals. In the Col di Tenda are mines of lead and silver. The Val d' Anzasca is renowned for its auriferous pyrites, the Val di Macagnaga for its beds of auriferous schists, and the Val d' Aosta for copper pyrites. In the serpentine rocks bordering the Gulf of Genoa are rich ores of copper; while the mountains of Modena are filled to their very summits with ores of iron, lead, and silver, and most valuable deposits of copper. The Apuan Alps, adjacent to the Modena chain, and forming the N. frontier of Tuscany, are traversed by veins of quicksilver, magnetic iron ore, and argentiferous copper and lead ores. The central and S. districts of Tuscany are equally favored with metalliferous deposits, among which the mines of Terricio and Castellina in the centre, and those of Monte Catini near Volterra, deserve special mention. Further off are the mines of Campiglia, from which the Etruscans drew the greater part of their bronze. During the Middle Ages also various mines of iron, lead, copper, silver, alum, and sulphur were worked with great success in Massa Maritima, hence called Massa Metallifera to distinguish it from Massa Carrara. All over the face of the country, now covered with marsh and ravaged by fever, ancient pits and ruins of old foundries are counted by the hundred. This same region, in the districts between Massa and Monte Catini, contains the famous *soffioni*, or vapor vents, utilized for the extraction of boracic acid. The districts of Siena and Grosseto also have silver and copper mines; and in S. Tuscany, besides these, are veins of quicksilver at Selvina, Plan Castagnajo, and Castellazzero, and lodes of antimony at Montanto and Pereta. All these districts are on the W. flank of the Apennines. The former States of the Church are poor in metallic deposits; but

Fig. 292. — Arch of Septimius Severus (Rome).

the Calabrias possess iron lodes and ancient silver-mines. The most important product of the Italian mines is sulphur, which is found in the island of Sicily and exported in large quantities. In many places there are excellent marble quarries, the best near Verona and Carrara. Alabaster and asbestos are found in many of the mountains. The salt manufactured on the sea-shore and from saline springs is largely exported.

Commerce. The commerce and industry are rapidly progressing since the unification of *I.* into a kingdom. The principal manufactures are silk, woollen, linen, and cotton goods, lace, straw hats, leather, pottery, and glass. Chemicals are largely manufactured, as also paper. The imports chiefly consist of sugar, coffee, and other colonial produce, muslins, calicoes, linens, woollens, hardware, and dyestuffs. The chief exports are raw and manufactured silks, rice, fish, fruit, sulphur, marble, velvet, mosaics, etc. The following table of imports and exports for the years 1876 and 1877 shows the relative importance of the commercial intercourse of *I.* with the different countries: —

Countries.	Imports, 1876.	Imports, 1877.	Exports, 1876.	Exports, 1877.
	Lire	Lire.	Lire.	Lire.
France................	428,200,000	332,100,000	547.300,000	418,900.000
England	309,400,000	296,500 000	133,900,000	125,700,000
Austro-Hungary.......	265,300,000	237,500,000	187,600,000	135,000,000
Switzerland	33,100,000	28,000,000	151,500,000	131,500,000
Russia.................	34.900,000	28.400,000	34,600,000	20,000,000
United States..........	49,500,000	39,900,000	20,500,000	27,200,000
Germany..............	40,100,000	25,200,000	20,600,000	16,600,000
South America	37,800,000	50,800,000	42,700,000	43,500,000
Turkey	62,400,000	55,600,000	6,100,000	8,500,000
Other Countries........	66,500,000	60,300,000	72,000,000	39,600,000
Total.	1,327,200,000	1,154,300,000	1,216,800,000	966,500,000

The value of articles of food, raw materials, manufactured goods, miscellaneous goods, and precious metals, imported and exported during the year 1877 (including transit trade), was as follows: —

Articles.	Imports.	Exports.
Grain	94,000,000	70,000,000
Seeds and fruit....................	15,000,000	60,000,000
Colonial goods	108,000,000	3,000,000
Tobacco	27,000,000	....
Wine, beer, ale, etc...............	14,000,000	13,000,000
Animals and food for animals......	64,000,000	115,000,000
1. Articles of food............	322,000,000	261,000,000
Fuel..............................	43,000,000	5,000,000
Axes, etc........................	9,000,000	36 000,000
Metals, raw......................	63.000,000	22,000,000
Hair, hides, and leather	48.000 000	19,000,000
Spinning materials...............	125,000,000	162,000,000
Wood and carving materials......	46,000,000	11,000,000
2. Raw materials.............	334,000,000	255,000,000
Glass and pottery ware.	15,000,000	6,000,000
Yarns...........................	82,000,000	116,000,000
Woven goods and articles of clothing..........................	170.000,000	23,000,000
Manufactures of different kinds....	112,000,000	120,000,000
Paper, books, etc................	7,000,000	7,000,000
3. Manufactured goods.......	386,000,000	272,000,000
Manure..........................	2,000,000	2,000,000
Drugs and chemical products	32,000,000	49.000,000
Resin, fats, and oils	64,000,000	109,000,000
4. Miscellaneous goods........	98,000,000	160,000,000
5. Precious metals...........	14,000,000	19,000,000
Total	1,154,000,000	967,000,000

The commercial intercourse of *I.* with the U. States for the 10 years from 1869 to 1878 was as follows: —

Years.	Imports from the U. States.		Exports to the U. States.	Total Imports and Exports.
	Domestic.	Foreign.		
	$	$	$	$
1869....	5,682,951	23,224	6,209 863	11,916,038
1870....	6.344,912	129,741	6,641,664	13,116,317
1871....	6.090,449	68,776	7,443,754	13,602,979
1872....	5,438,718	13.468	7,592,191	13,044,377
1873....	7,241,097	54,552	7,974,542	15,270,191
1874....	8,378,666	4.019	8,499.294	16,881,979
1875....	7,226,554	1,515	9,190.182	16,418,251
1876....	7,770,470	17,005	7,628.772	15,416,247
1877....	8,484,496	10,172	7,105,366	15.600,034
1878....	8,736,719	4,381	6,711,006	15,452,106

The value of the principal articles imported from and exported to the U. States was as follows: — *Imports:* Indian corn, $833,095; wheat, $40,040: coal, $9,676; raw cotton (18,110,597 lbs.), $1,934,212; drugs, etc., $15,085; naval stores, $57,034; mineral oil, $2,368,549; cotton-seed oil, $778,042; lard, $9,875; pork, $9,326: spirits from grain (92,042 gals.), $29,584; tallow, $98,102; tobacco (leaf), $2,239,943. — *Exports:* Argols, $28,839; chemicals, etc., $608,356; essential oils, $203,958; sulphur, $1,161,367; fancy goods, $8,764; fruits and nuts of all kinds, $2,759.045; kid gloves, $11,086; marble, $398,205; olive-oil, $94,965: paintings, etc., $62,671; salt, $56,381; straw (manuf. of), $107,994; wine, $40,047.

To carry the above trade, 64 American vessels (tonnage 32,333) entered, and 76 (tonnage 37.863) cleared the Italian ports; 198 Italian vessels (tonnage 94,525) entered, and 453 (tonnage 464,450) cleared the American ports.

Finances. Since the establishment of the kingdom in 1861 the finances have been in an unsatisfactory condition. In every year, down to 1878, when for the first time the budget estimates left a surplus of 12,900,699 lire, the expenditures have considerably exceeded the revenue, necessitating large loans, foreign and internal, in consequence of which the public debt of *I.*, which stood at 2,439 millions of lire, or $487,400,000, in 1860, the year before the establishment of the kingdom, had increased to 9,750 millions of lire, or $1,950,000,000 in 1878. The debt was made up of the following liabilities: —

Liabilities.	Lire.
Funded debt inscribed in the "Libro Grande"........................	7,091,829,661
Redeemable debt in the "Rentes" of 3 and 5 per cent..........................	1,642,773,107
Treasury bonds...........................	183.010,500
Paper currency...........................	840,000,000
Total................................	9,757.613,267 $1.950,000,000

As a guaranty for the issued treasury bonds and of paper currency, which has a forced circulation, the government has deposits of certificates of the funded debt, bearing no interest, in the National Bank of *I.* The total amount of these deposits was calculated at 1,150,000,000 lire, or $230,000,000, in 1878. Nearly all the cities and communes of *I.* have their own budgets and debts, the latter, like the national liabilities, tending to constant increase. The total revenue of the communes of *I.* in 1878 amounted, according to official reports, to 466,000,000 lire, or $93,200,000, exclusive of those of the provinces of Rome. The amount was 316,800,000 lire, or $63.360,000, in 1867, the first year in which Venice appeared as in *I.* There was thus an increase of 149,300,000 lire, or $29,860,000, in the revenue during the ten years. The burden of the revenue per head of the population rose during the time in question from 12 lire, or 10*s.*, to 18 lire, or 15*s.* In the urban communes — that is, in towns containing over 5,000 inhabitants — and the chief towns of provinces, the burden per head of the population was 34 lire, or £1 8*s.*, against 10 lire 80*c.*, or 8*s* 6*d.*, in the rural communes. The burden per head of the urban population of *I.* was in 1878, in the province of Rome, 71 lire 62*c.*, or $14.32, and of the rural population of the kingdom, 19 lire 25*c.*, or $3.85.

Shipping. The number and tonnage of merchant vessels belonging to the kingdom, on January 1, 1879, were as follows: —

Tonnage of Vessels.	Sailing vessels.		Steamers.	
	No.	Tons.	No.	Tons.
From 801 to 1,000 tons....	8	7,145	......	....
" 501 to 800 "	172	100,216	9	4,893
" 301 to 500 "	591	363,648	34	11,608
" 101 to 300 "	1,357	252,852	31	6,212
" 21 to 100 "	3,011	140.786	......	....
" 6 to 20 "	3,493	41,962	......	....
Under 6 tons..............	9,214	24,775	36	2,427
Total................	17,846	933,184	110	25,140

Railroads. The total length of lines open for traffic at the beginning of 1879 was 8,210 chilometri, or 5,131 miles, of which 2,126 chilometri, or 2,049 miles, belonged to the State, and 6,084 chilometri, or 3,082 miles, to private companies. The whole of the lines are divided into five systems, of the following extent: —

Railroads.	Length.	
	Chilometri.	Miles.
Alta Italia..............................	3,379	2,112
Roman (Romane)......................	1,673	1,045
Southern (Meridionali)................	1,454	908
Sardinian (Sarde).....................	198	124
Sicilian (Calabro-Sicule)...............	949	593
Various lines..........................	557	349
Total...........................	8,210	5,131

The first line of railroad was open in 1839, and the progress of construction was slow till 1861, from the beginning of which year till the end of 1866 the length opened for traffic rose to 2,902 chilometri, or 1,814 miles. In the following six years, till the end of 1872, the length opened for traffic was 1,663 chilometri, or 1,039 miles, and in the next three years, till the end of 1875, it was 932 chilometri, or 583 miles. The construction of railroads by the State was begun in recent years, in order to extend, more rapidly than private enterprise was willing to do, the existing network of lines. In October, 1875, the government purchased from the South-Austrian and Lombardo-Venetian Railroad Company the Italian portion of the system, or the "Alta Italia" lines, of a length of 1,444 chilometri, or 915 miles. In the session of 1878 the Italian Parliament passed a bill for the construction of an additional 4,000 chilometri, or 2,500 miles, of railroad, to complete the existing system. The new lines are to be built within a period of 15 years, at a total cost of 830,000,000 lire, or $170,000,000, with a State contribution of 650,000,000 lire, or $130,000,000, paid in annual instalments of 50,000,000 lire, or $10,000,000.

Money, Weights, and Measures. The money, weights, and measures of *I.* are the same as those of France, the names only being altered, the Franc changing into the Lira, divided into 100 Centesimi, the Kilogramme into the Chilogramma, the Mètre into the Metro, the Hectare into the Ettara, and so on. The American equivalents are: —

MONEY.

The *Lira*, of 100 *Centesimi* = Average rate of exchange, $0.193.

WEIGHTS AND MEASURES.

The *Gramma*.............	=	15.434	grains troy.
" *Chilogramma*	=	2.20	lbs. avoirdupois.
" *Quintal Metrici*.......	=	220	" "
" *Tonnelata*............	=	2200	" "
" *Litro*, Liquid Measure	=	0.22	gallon.
" *Ettolitro* { Liquid Meas.	=	22	"
" *Ettolitro* { Dry Measure	=	2.75	bushels.
" *Metro*................	=	3.28	feet, or 39.37 inches.
" *Chilometro*...........	=	1093	yards.
" *Metro Cube* } " *Stero* }.........	=	35.31	cubic feet.
" *Ettara*, or *Hectare*.....	=	2.47	acres.
" *Square Chilo*, or *Kilomètre Carré*	=	0.386	square mile.
		(2.59	sq. chilo — 1 sq. mile.)

The common currency of the kingdom in recent years has been paper money of various denominations, gold standing at a premium of from 12 to 18 per cent.

Seaports. The principal harbors of *I.* are: on the W., Genoa, Gallipoli, Chiavari, Spezia, Leghorn, Civita Vecchia, Gaeta, Naples, and Reggio; on the S., Taranto; on the E., Brindisi, Bari, Ancona, Rimini, Chioggia, and Venice. Among these ports, a special notice is given below to those which have some connection with American trade. The ports of Messina and Palermo are given under SICILY, and Cagliari under SARDINIA.

Chiavari, a maritime town of the province of Genoa, 21 m. E. S. E. of the city of that name, on the Gulf of Rapallo, at the mouth of the Sturia. The best Italian anchovies are fished here, and largely exported. Pop. 15,000.

Civita Vecchia, a seaport town of the Roman territory, in lat. 42° 4′ 38″ N., lon. 11° 44′ 52″ E. It is the best and almost the only port on the coast of the former States of the Church, and is about 24 m. to the W. of Rome. The port enjoyed under the Popes commercial freedom and sundry special privileges. But its commerce declined in recent times almost to zero. Pop. 9,000.

Gaëta, a fortified seaport town of S. Italy, prov. Caserta, at the end of a peninsula, on the W. shore of the kingdom, forming the N. W. boundary of the gulf to which it gives its name; 4 m. S. S. W. of Mola di Gaeta, 41 N. W. of Naples, and 72 S. E. of Rome. The town is regarded as one of the keys of S. Italy, being strong from its natural position, which art has taken advantage of. Its port, which has 7 fathoms water, though not the largest, is one of the safest and best in Italy. *G.*, situated in a beautiful tract of country, is the centre of a considerable trade. Pop. 20,000.

Gallipoli, a fortified seaport town of S. Italy, prov. Lecce, on a rocky islet on the E. coast of the Gulf of Taranto, 49 m. S. E. of Taranto, and 28 W. S. W. of Otranto. *G.* is connected by a bridge with the main-land, on which is its suburb Lizza. *G.* displays an air of great industry, if not of affluence, and is the most frequented of all the ports on the S. E. coast of Naples, being the great mart for the oil of Apulia, most of which is shipped here. Many of the inhabitants are engaged in the tunny fisheries. Pop. 10,000.

Genoa, a maritime city of *I.*, once the capital of the famous republic of that name. It is situated at the bottom of the extensive gulf to which it gives its name; the light-house being in lat. 44° 24′ 18″ N., lon. 8° 54′ 24″ E. Genoa is one of the finest and most interesting cities of Europe. Being built on a rising ground, in the form of an amphitheatre, with the bare summits of the Apennines and the ice-covered peaks of the Alps behind, the appearance of the city from the sea is most magnificent, and justifies the old epithet given to her of *la Superba*. The harbor is semicircular, the diameter being about 1,000 fathoms. It is artificial, being formed by 2 gigantic moles, having opposite directions. That on the E. side, called the old mole (*molo vecchio*), projects from the centre of the city W. by S. It is about 260 fathoms in length. The new mole (*molo nuovo*), on the opposite side of the port, adjoins the S. extremity of the suburb of St. Pietro d'Arena, projecting about 210 fathoms from the shore in an E. S. E. direction. The heads of the moles bear from each other N. E. by E., and S. W. by W., the distance between them, forming the entrance to the harbor, being about 350 fathoms. The light-house is without the port, on the W. side, near the extremity of a point of land, and contiguous to the bottom of the new mole. It is a lofty square tower, and as it stands on a high rock, and is painted white, it is visible in clear weather at a great distance. There is no difficulty in entering the harbor; the ground is clean, and there is plenty of water, particularly on the side next the new mole: care, however, must be taken, in coming from the W., to give the light-house point a good offing. Moderate-sized merchantmen commonly anchor inside the old mole, contiguous to the *porto franco*, or bonded warehouses, having a hawser made fast to the mole, and an anchor ahead. Men-of war and the largest class of merchantmen may anchor inside the new mole, but they must not come too near the shore. Ships sometimes anchor without the harbor in from 10 to 25 fathoms, the light-house bearing N. ½ W.; distance 2 or 3 m. The S. W. winds occasion a heavy swell, but the bottom is clay, and holds well. Within the town are 2 rather shallow basins designed for galleys and small trading vessels. There is also an arsenal. Genoa is the entrepôt of a large extent of country; and its commerce, though inferior to what it once was, is very considerable, and has latterly been increasing. It is a free port; that is, a port where goods may be warehoused and exported free of duty. The exports consist partly of the raw products of the adjacent country, such as olive-oil, rice, vermicelli, hemp, rags, argol, etc.; partly of the products of her manufacturing industry, such as silks, damasks, and velvets (for the production of which she has long been famous), thrown silk, paper, soap, works in marble, alabaster, coral, etc.; the printed cottons of Switzerland, and the other products of that country and of the western parts of Lombardy, intended for the S. of Europe and the Levant; and partly of the various foreign products brought by sea and placed in *porto franco*. The imports principally consist of cotton, cotton stuffs and yarn, iron and hardware, linens and woollens, machinery, copper, coals, etc.; cotton-wool, mostly from the U. States and Egypt; corn from the Black Sea, Sicily, Barbary, and the U. States; sugar, spices, coffee, cochineal, and indigo, hides; naval stores from the Baltic; codfish, wool, tobacco, lead (principally from Spain), wax, etc. Corn, barilla, Gallipoli oil, cotton, valonia, sponge, galls, and other products of the countries adjoining the Black Sea, Sicily, the Levant, etc., may in general be had here, though not in so great abundance as at

Leghorn Numerous lines of steamers ply between Genoa and Leghorn, Civita Vecchia, Spezia, Naples, Messina, Tunis, Nice, Marseilles, etc.

The *Bank of Genoa*, or of St. George, was one of the most ancient and celebrated banks of circulation and deposit in Europe Until 1746, when the bank was pillaged by the Austrians, it was customary to make all bills of exchange drawn upon Genoa payable in *banco*, but since then they have generally been made payable in money *fuori di banco*. In 1800, when the French were besieged in Genoa by the Austrians, they took the treasure of the bank to pay their troops. The establishment has never recovered from this blow; some warehouses and a part of the town's revenue were assigned to it, but they yield a very poor dividend It is no longer used as a place of deposit for money. In 1844 a new bank was established in Genoa, which being united in 1855 to a bank that had been established at Turin in 1847, has the title of National Bank (*Banca Nazionale*). Its capital amounts to 32,000,000 lire, in shares of 1,000 lire each. It is authorized to issue notes of the value of 1,000, 500, 250, 100, 40, 25, 10, and 5 lire. The amount of its notes in circulation and debts payable on demand were, down to 1866, limited to 3 times the amount of the coin in its coffers. But the crisis of that year led unfortunately to the introduction of an inconvertible paper currency. The bank discounts mercantile paper, and transacts all kinds of ordinary banking business. It has branches at Turin and other places.

Leghorn [It. *Livorno*], a city and seaport of the province of Tuscany, in lat. 43° 33′ 5″ N., lon. 10° 16′ 45″ E. Leghorn has an outer harbor, protected by a fine mole, running in a N. N. W. direction upwards of ½ m. into the sea, and a small inner harbor, or basin. The water in the harbor is rather shallow, varying from 8 feet in the inner basin to 18 or 19 feet at the end of the mole. The rise of the tide is about 14 inches. Ships lie within the mole with their sterns made fast to it by a cable, and an anchor out ahead. The light-house is built on a rock a little to the S. W. of the mole. It is a conspicuous object. being about 170 feet above the level of the sea. The roadstead lies W. N. W. of the harbor, between it and the Melora bank. The latter is of sand, lying N. and S., 4 m. in length by 2 in breadth, the side nearest the shore being about 4 m. from it. It consists, for the most part, of sand and mud, and has from 3 fathoms to ½ fm. water over it; but towards its S. extremity it is rocky; and there, on some of the points which project above the water, the Melora tower has been constructed to serve as a sea-mark; it bears from the light-house W. ½ N., distant about 4 m. The best course for entering the roads is to keep to the northward of the Melora bank at about 1 m. from it, and then, having doubled it, to stand on for the light-house about 2½ m., anchoring in from 7 to 9 fathoms, the light-house bearing S. S. E. ½ E., 4 m. off. During southerly winds there is sometimes a heavy sea in the roads, but the holding ground is good; and with sufficient anchors and cables, and ordinary precaution, there is no danger. The Lazaretto lies to the S., about 1 m. from the tower, and is said to be one of the best in Europe. The comparative security and freedom which foreigners have long enjoyed in Tuscany, still more than its advantageous situation, render Leghorn the greatest commercial city of *I*. Its exports are similar to those from Genoa. Leghorn plaiting for straw hats is the finest in the world; and large quantities are imported into the U. States. Besides the above, all sorts of articles, the produce of the Levant, may be had at Leghorn. The imports are exceedingly numerous and valuable, comprising all sorts of commodities, with the exception of those produced by Italy. Ships with corn on board may unload within the limits of the Lazaretto, without being detained to perform quarantine,—a circumstance which has contributed to make Leghorn one of the principal depots for the wheat of the Black Sea. Hard wheat, particularly from Taganrog, is in high estimation here and in the other Italian ports. It is particularly well fitted for making vermicelli, macaroni, etc.

In 1835 a joint-stock bank was established in Leghorn, with a capital of 2,000,000 lire, in shares of 1,000 lire each. The whole of the capital is paid up, and the responsibility is limited to the capital. The managers have the power of issuing promissory notes to the extent of 6,000,000 lire. These notes, though received by the government, are not legal tender. The operations of the bank are confined to the discounting bills of exchange not having more than 4 months to run, and to the purchase and sale of foreign coins. The superintendence is vested in a director and 8 regents, nominated by the shareholders; and the government appoints a commissary and 3 censors (from among the shareholders), who exercise the highest authority, to secure obedience to the statutes. An annual report and balance-sheet is produced, and is accessible to all shareholders. It is a profitable establishment, and its shares are at a considerable premium.

Naples, a large city and seaport in the S. of *I*., in Campagna, and formerly the capital of the kingdom of the same name, on the N. side of the Bay of Naples, 118 m. S. E. of Rome, near the foot of Mt. Vesuvius; lat. 40° 51′ N., lon. 14° 15′ E The situation of Naples is one of the most delightful that can be imagined. In the form of an amphitheatre, it is built partly on the declivity of a hill, partly on the margin of a spacious bay, spreading its population along the shore, and covering the shelving coasts and adjacent eminences with its villas and gardens. The bay is extensive, and presents an almost unrivalled assemblage of picturesque and beautiful scenery. The entrance of the bay, from Cape Miceno on the N.W. to Cape Campanella on the S. E., has a width of about 20 m., with a circuit of about 35 m., and an indentation of about 15 m. It is well sheltered, and has good anchorage, with 7 fathoms of water. At the N. W. entrance are the islands of Ischia and Procida, and at the S. E. the island of Capri. Naples has 3 ports: the Porto Piccolo (the ancient port of Palæopolis), now only suited to small craft; the Porto Militare, a new harbor with a depth of water of 5 fathoms, bounded S. by

Fig. 293. — Peasant of the Campagna.

a mole which runs in a S. E. direction into the sea for a distance of 1,200 ft.; and the Porto Grande, the principal port, but with only 3 or 4 fathoms in its deepest part, having suffered from the silting of the sand and shingle. The most important manufacture is of macaroni and vermicelli, which constitute the principal food of the people. Next in importance is the production of silk goods, the Gros de Naples taking its name from the manufacture of this city. There are also iron and glass works, manufactories of carpets, broadcloth, chemical soaps, perfumery, artificial flowers, corals, porcelain, hats, carriages, gloves, etc The exports principally consist of the products of the adjacent country. Of these, silk and olive-oil are the most important. The other articles of export are wool, wine, brandy, dried fruits, red and white argol, tallow, licorice, gloves, madder, hemp, linseed, cream of tartar, bones, lamb and kid skins, oak and chestnut staves, rags, saffron, etc. The chief imports are sugar, coffee, spices, coal, salted fish, cotton, woollen, silk, and flax goods; iron, tinware, and hardware. — The principal merchants of Naples are all, more or less, bankers inasmuch as they advance money on letters of credit, and deal in foreign exchanges, and other financial operations, which are too often carried on in a

reckless manner. There are, however, several great banking establishments which are perfectly secure. — Goods are universally sold at long credits, mostly from 4 to 8 months; and for manufactured goods, sometimes longer. On sales of indigo, from 12 to 18 months' credit is given. Discount for ready money is at the rate of 6 per cent per annum. Merchants are arranged by the Chamber of Commerce into 5 different classes; and a 6 months' credit is given to individuals at the custom-house for duties according to the class in which they happen to be enrolled. But this is of little importance. Unless the transactions of a merchant be very limited indeed, the duties he has to pay amount to much more than the credit he is allowed.

Venice, a famous city and seaport of *I.*, formerly the capital of the republic of that name, and previous to 1866 belonging to the Austrian Empire, on a cluster of small islands in the northern extremity of the Adriatic, now joined to the mainland by a railroad bridge, part of the line to Padua, in lat. 45° 25′ 53″ N., lon. 12° 20′ 31″ E. The islands on which Venice is built lie within a line of long, low, narrow islands, running N. and S., and enclosing what is termed the lagoon, or shallows, that surround the city, and separate it from the mainland. The principal entrance from the sea to the lagoon is at Malamocco, about 1½ leagues S. from the city; but there are other, though less frequented entrances, both to the S. and N. of this one. There is a bar outside Malamocco, on which there are not more than 10 feet at high water at spring tides; but there is a channel between the W. point of the bar and the village of San Pietro, which has 16 feet water at springs, and 14 at neaps. Merchant vessels usually moor off the ducal palace; but sometimes they come into the grand canal which intersects the city, and sometimes they moor in the wider channel of the Giudecca. On arriving at the bar ships are conducted across it and into port by pilots, whose duty it is to meet them outside, or on the bar, and of whose services they must avail themselves. — The commerce of Venice, once the most extensive of any European city, is now comparatively trifling, and it is perhaps the only commercial city whose population has not increased since the unification of *I.*

In 1830 Venice was made a free port, and down to 1866, when she became part of the kingdom of *I.*, fully participated in every privilege conferred on Trieste. But, notwithstanding this circumstance, the latter continued to preserve the ascendency; and the revival of trade that has taken place at Venice has not been so great as might have been anticipated. The truth is, that except in so far as she is the entrepôt of the adjoining provinces of Lombardy, Venice has no considerable natural advantage as a trading city; and her extraordinary prosperity during the Middle Ages is more to be ascribed to the comparative security enjoyed by the inhabitants, and to their success in engrossing the principal share of the commerce of the Levant, than to any other circumstance. Still, however, her trade is far from inconsiderable. Venice has always been celebrated for its glass pearls, beads, and other glass wares, made in the city and on the island of Murano. The ancient manufacture of brocade tapestry has recently been revived, and also that of the lace-work for which the adjacent island of Burano was always celebrated; and a new feature of industry is the imitation of ancient furniture, made of pear-wood and bone instead of the ebony and ivory formerly used. The great articles of import are sugar, coffee, tobacco, and other colonial products, indigo and other dyestuffs, olive-oil, oil-seed, coal, iron, salted fish, various descriptions of cotton, woollen, and other manufactured goods, wheat and other grain, tin plates and hardware, raw cotton, etc. Venice is the principal market of the petroleum trade with the U. States. The exports principally consist of silk and silk goods, wheat and other grain, paper, jewelry, glass, and glass wares, Venetian treacle, books, with a great variety of other articles, including portions of most of those that are imported.

Item, a memorandum; a new article; one of the particulars of an account.

Ithaca, Auburn, and Western R.R. runs from Freeville, N. Y., to Scipio, N. Y., 27 m. This Co., whose offices are in New York City, has succeeded the Western Extension of the New York and Oswego Midland R.R, which was sold under foreclosure. The road is now operated as a branch of the Utica, Ithaca, and Elmira R.R. *Financial statement:* Cap. stock, $970,000; funded debt, $514,650, as follows: 1st mortgage bonds, issued 1876, $16,560, payable 1906, interest 7 % (June and Dec.); 2d mortgage bonds (income for 3 years), issued 1877, $498,090, payable 1907, interest 7 % (July and Jan.).

Itinerant, a wanderer; a pedler; a workman who travels from place to place.

Itinerary, a distance-guide, etc., for travellers; an account or description of a country.

Ivory, the commercial name for the bony matter of the tusks of the elephant, the teeth of the hippopotamus and walrus, the horn of the narwhal, etc. Elephant *I.* is the most esteemed, and that obtained in the largest quantity. The tusks of elephants are hollow at the root, tapering, and of various sizes, depending principally on the age of the animal. Color externally, yellowish, brownish, and sometimes dark; internally, white. The best are large, straight, and light-colored, without flaws; not very hollow in the stump, but solid and thick. The most esteemed come from Africa, being of a closer texture, and less liable to turn yellow, than those from the East Indies. In trade, they are usually thus divided: First sort, weighing 70 lbs. or upward; second sort, weighing 56 lbs. to 60 lbs.; third sort, weighing 38 lbs. to 56 lbs.; fourth sort, weighing 28 lbs. to 37 lbs.; fifth sort, weighing 18 lbs. to 27 lbs. All under 18 lbs. are called *scrivelloes*, and are of the least value. In purchasing elephants' teeth, those that are very crooked, hollow, and broken at the ends, or cracked and decayed in the inside, should be rejected; and care taken that lead or any other substance has not been poured into the hollow. The western and eastern coasts of Africa, the Cape of Good Hope, Ceylon, India, and the countries to the eastward of the Straits of Malacca are the great marts whence supplies of *I.* are derived. The chief consumption of *I.* is in the manufacture of handles for knives; but it is also extensively used in the manufacture of musical and mathematical instruments, chess-men, billiard balls, plates for miniatures, toys, combs, etc. *I.* articles are said to be manufactured to a greater extent, and with better success, at Dieppe, than in any other place in Europe. But the preparation of this beautiful material is much better understood by the Chinese than by any other people. No European artist has hitherto succeeded in cutting concentric balls after the manner of the Chinese; and their boxes, chess-men, and other *I.* articles are all far superior to any that are to be met with anywhere else. The value of *I.* and *I.* goods imported into the U. States during the year 1878 was $327,955.

Imp. duty: unmanufactured, free; bagatelle, billiard, and chess balls, chess-men, dice, and draughts, of *I.*, 50 per cent.; all other manuf. of *I.*, 35 per cent.

Manuf. In the working up of *I.* into handles, billiard balls, chess-men, organ and piano-forte keys, veneers, etc., much difficulty is experienced; for some of the tusks are more hollow than others, some more crooked, some more irregular in color and texture. The larger and straighter the tusk, the easier it is to work. Thin saws are used to cut up the tusk, and great tact is needed in arranging the cuts so that the valuable substance may be applied to the best advantage. Each variation in hardness, whiteness, etc., renders the *I.* useful for some purposes rather than others; and it is the *I.*-worker's business to determine all those matters as he goes on. He pencils the tusk, after closely examining it, and makes his saw-cuts along the pencil-marks. The turning, planing, polishing, carving, etc., of *I.*, depend on the same mechanical principles of hard wood; but the peculiarities and costliness of the substance render great care necessary (see VENEER). *I.* is exquisitely smooth in working, altogether devoid of the harsh, meagre character of bone, and is in all respects the most suitable material for ornamental turning, as it is capable of receiving the most delicate lines and cutting. The artists of Greece and Rome carved from the tusks of the elephant beautiful statues, and *I.* was also a favorite material for sculpture in the Middle Ages. *I.* can be bleached, and also dyed, by various modes of treatment. To render it soft and transparent, small pieces of the article are laid in strong phosphoric acid until they become transparent, then rinsed in water, and dried in pure linen. When dry it is translucent and hard, but softens as often as it is dipped in warm water or milk. The time of immersion in the acid differs with different pieces of *I.* If certain parts are to retain their original character, they are covered with a varnish before immersion. The acid probably acts by forming an acid phosphate of lime out of the buric phosphate which constitutes three fourths of *I.* The process

of hardening *I.* which has become pliable by age consists in boiling it for some time in a solution of gelatin. — Many substitutes for *I.* have been introduced. The best is celluloid (see CELLULOID), which for many purposes is often preferred to *I.* See also VEGETABLE IVORY.

Ivory Black, a kind of vegetable charcoal, prepared by calcining the shavings and dust of ivory. It is ground and levigated on a porphyry slab to produce the beautiful velvety material which is the chief ingredient of the ink used in copperplate printing. The name is also frequently applied to bone-black. See CHARCOAL (ANIMAL).

Ivory Fictile is plaster of Paris which has been made to absorb a certain amount of melted spermaceti, or by mixing the plaster with yellow ochre. It is used for casts.

Ivory Nut. See VEGETABLE IVORY.

END OF VOL. I.